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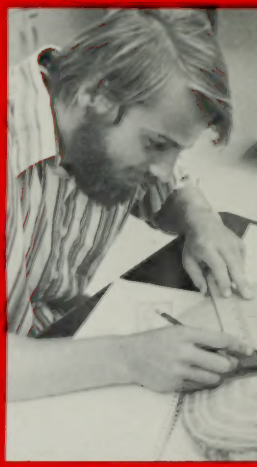
North Carolina State University Bulletin

UNDERGRADUATE CATALOG 1975-1977



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North Carolina State University

Raleigh, North Carolina

Undergraduate Catalog
1975-77

THE UNIVERSITY OF NORTH CAROLINA

Sixteen Constituent Institutions

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J. Lem Stokes II, A.B., M.Div., Ph.D., *Associate Vice President—Academic Affairs*
Robert W. Williams, A.B., M.A., Ph.D., *Associate Vice President—Academic Affairs*

The University of North Carolina was chartered in 1789 and opened its doors to students at its Chapel Hill campus in 1795. Throughout most of its history, it has been governed by a Board of Trustees chosen by the Legislature and presided over by the Governor. During the period 1917-1972, the Board consisted of one hundred elected members and a varying number of *ex-officio* members.

By act of the General Assembly of 1931, without change of name, it was merged with The North Carolina College for Women at Greensboro and The North Carolina State College of Agriculture and Engineering at Raleigh to form a multicampus institution designated The University of North Carolina.

In 1963 the General Assembly changed the name of the campus at Chapel Hill to The University of North Carolina at Chapel Hill and that at Greensboro to The University of North Carolina at Greensboro and, in 1965, the name of the campus at Raleigh was changed to North Carolina State University at Raleigh.

Charlotte College was added as The University of North Carolina at Charlotte in 1965, and, in 1969, Asheville-Biltmore College and Wilmington College became The University of North Carolina at Asheville and The University of North Carolina at Wilmington respectively.

A revision of the North Carolina State Constitution adopted in November 1970 included the following: "The General Assembly shall maintain a public system of higher education, comprising The University of North Carolina and such other institutions of higher education as the General Assembly may deem wise. The General Assembly shall provide for the selection of trustees of The University of North Carolina. . . ." In slightly different language, this provision had been in the Constitution since 1868.

On October 30, 1971, the General Assembly in special session merged, without changing their names, the remaining 10 state-supported senior institutions into the University as follows: Appalachian State University, East Carolina University, Elizabeth City State University, Fayetteville State University, North Carolina Agricultural and Technical State University, North Carolina Central University, North Carolina School of the Arts, Pembroke State University, Western Carolina University, and Winston-Salem State University. This merger, which resulted in a

statewide multicampus university of 16 constituent institutions, became effective on July 1, 1972.

The constitutionally authorized Board of Trustees was designated the Board of Governors, and the number was reduced to 32 members elected by the General Assembly, with authority to choose their own chairman and other officers. The Board is "responsible for the general determination, control, supervision, management, and governance of all affairs of the constituent institutions." Each constituent institution, however, has its own board of trustees of 13 members, eight of whom are appointed by the Board of Governors, four by the Governor, and one of whom, the elected president of the student body, serves *ex officio*. The principal powers of each institutional board are exercised under a delegation from the Board of Governors.

Each institution has its own faculty and student body, and each is headed by a chancellor as its chief administrative officer. Unified general policy and appropriate allocation of function are effected by the Board of Governors and by the President with the assistance of other administrative officers of the University. The General Administration office is located in Chapel Hill.

The chancellors of the constituent institutions are responsible to the President as the chief administrative and executive officer of The University of North Carolina.

North Carolina State University

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Assistant Provosts
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Athletics
Willis R. Casey, *Director*
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Student Supply Store
Mark H. Wheless, *General Manager*

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North Carolina State University

North Carolina State University is a large and complex state university, one of the major state universities of the nation.

It shares the distinctive character of Land-Grant state universities nationally—broad academic offerings, extensive public involvement, national and international activities, and large-scale extension and research programs.

State was founded as a Land-Grant state university under terms of the famed federal Morrill Act of 1862 which provided for public land endowments to support a college in each state.

The Land-Grant heritage of fulfilling three major functions—research, extension and academic affairs—is reflected in the large dimensions of these functions at North Carolina State University.

The rich and varied academic program of the University is comprised of some 90 bachelors of arts and science programs, 68 master's degree fields and 45 doctoral degrees.

Its research activities span a broad spectrum of about 700 scientific, technologic and scholarly endeavors, with a budget of over $20 million annually.

Extension programs of the University are similarly diverse and include urban affairs, marine sciences, environmental protection, engineering industrial and textiles extension, agricultural extension and many others.

The annual University budget is about $83 million. The University has 4,600 employees. There are 1,621 faculty and professional staff and 174 adjunct and federal agency faculty including 974 graduate faculty.

There are 120 campus buildings with an estimated value of about $150,000,000.

The central campus is 596 acres, though the University has 88,000 acres, including one research and endowment forest of 78,000 acres. Research farms; biology and ecology sites; genetics, horticulture, and floriculture nurseries; and Carter Stadium areas near the main campus comprise about 2,500 acres.

North Carolina State University is one of the three Research Triangle Universities along with Duke University and the University of North Carolina at Chapel Hill. In the 30-mile triangle formed by the three Universities is the 5,000-acre Research Triangle Park, the Research Triangle Institute, a Universities' subsidiary, and the Triangle Universities Computation Center, a central facility for the extensive computing centers of the institutions.

The University's total enrollment is about 15,750. There are about 12,801 undergraduates, 2,635 graduate students and about 315 other students. Students at N. C. State come from all 50 states and some 50 other countries. The international enrollment is a distinctive feature of the institution since its 477 international students give it a decidedly cosmopolitan aura.

North Carolina State University is organized in eight schools and the Graduate School. The eight schools are Agriculture and Life Sciences, Design, Education, Engineering, Forest Resources, Liberal Arts, Physical and Mathematical Sciences and Textiles. In addition, a complex of divisions and programs provide for a wide range of special programs in academic affairs, research and extension.

State is one of 118 recognized members of the National Association of State Universities and Land-Grant Colleges. It is also a member of the American Council on Education, the College Entrance Examination Board, the Council of Graduate Schools in the United States, the National Commission on Accrediting, and the Southern Association of Colleges and Schools.

The University is accredited by national and regional accrediting agencies applicable to the University and its numerous professional fields.

In the fall of 1974, 71 percent of the entering freshmen were in the top one-quarter of their high school graduating classes. A total of 95.9 percent were in the top half of their classes. About 82 percent of all applicants were accepted. The average combined SAT score for the entering freshmen in 1974 was 1026.

Typically, the ratio of men and women students on the campus, including all graduate students and special students, is about three to one. In the fall of 1974, the Registrar's Office listed 11,657 male and 4,094 female students.

About one-third of the total student body consists of new students each fall. There were more than 5,158 in the semester this catalog was prepared. These include 2,821 freshmen, 720 transfer students, more than 442 special and unclassified students, and about 911 students who entered for graduate studies.

State has been heavily oriented to scientific and technological areas, illustrated by the designation of its schools. However, in the decade of the 1960's the rapid rise of the School of Liberal Arts and the quality of faculties in social sciences and humanities has given the University a typical major university character.

The largest schools are engineering and liberal arts. Liberal arts has an enrollment of 3,780 and engineering, 3,303.

The University offers 2,300 courses, giving students the opportunity to concentrate in a broad range of studies. The new multi-disciplinary program in liberal arts permits students to design their own courses of study. The Division of University Studies offers courses of special interest to all students—courses dealing with environmental and ecological problems, the world armament problem, and the world population crisis.

PROGRAMS OF STUDY

About 2,300 different courses are taught at North Carolina State University. These range from basic courses for freshmen to high level courses available only to graduate students working on Ph.D. degrees. The importance of this number of courses to students is that they constitute a wide range of curricula, that is, "fields of study" or majors, such as history, chemical engineering, business or conservation. Equally important, the courses can be combined in special cases to form entirely "new" majors or specializations of the student's particular interest. This is the case with a program in Liberal Arts called Multidisciplinary Studies.

N. C. State offers about 90 rather clearly defined undergraduate programs of study. In addition it offers options in many fields, such as the science, business or technology options in a number of agricultural fields.

The following is a listing of the majors offered at N. C. State as degree programs, specialized curricula, or options.

Agriculture
- Agricultural Economics
- Agronomy
- Animal Science
- Biological and Agricultural Engineering
- Crop Science
- Horticultural Science
- Pest Management for Crop Protection
- Poultry Science
- Soil Science

Business and Economics
- Economics
- Accounting
- Business Management

Biological Sciences
- Biological Sciences (General)
- Biochemistry
- Botany
- Entomology
- Fisheries and Marine Biology
- Microbiology
- Wildlife Biology
- Zoology

Design
- Architecture
- Environmental Design
- Landscape Architecture
- Product Design
- Visual Design

Education (incl. teacher certification)
- Agricultural
- English
- French
- Industrial Arts
- Mathematics
- Science (biology, chemistry, earth science & physics)
- Secondary Education
- Social Studies (economics, history, politics & sociology)
- Spanish
- Speech-Communication
- Technical
- Vocational and Industrial

Engineering
- Aerospace
- Chemical
- Civil
- Construction
- Electrical
- Engineering Science and Mechanics
- Engineering Operations
- Furniture Manufacturing and Management
- Industrial
- Materials
- Mechanical
- Nuclear

Forestry and Wood Sciences
- Forestry
- Pulp and Paper Science and Technology
- Wood Science and Technology

Food Science
- Food Science
- Nutrition

Humanities
- English and American Literature
- French Language and Literature
- History
- Philosophy
- Spanish Language and Literature
- Writing - Editing

Individualized Programs
- Individualized Study Program (Agriculture and Life Sciences)
- Multidisciplinary Studies (Liberal Arts)

Mathematics and Related Sciences
- Mathematics
- Computer Science
- Statistics

Physical Sciences
- Chemistry
- Geology
- Meteorology
- Physics

Medical and Veterinary Sciences
- Medical Technology
- Pre-dental
- Pre-medical
- Pre-veterinary

Psychology
- Psychology
- Experimental Psychology
- Human Resources Development

Recreation and Natural Resources
- Conservation
- Natural Resource Recreation Mgmt.
- Recreation and Park Administration

Social Sciences
- Politics
- Sociology
- Rural Sociology
- Criminal Justice
- Social Work

Speech
- Speech-Communication

Textiles
- Textile Chemistry
- Textile Technology

Agricultural Institute

This two-year program requires high school graduation and a letter of recommendation. The program does not carry transferable college credit as an Associate of Applied Science degree is awarded. Fields of study are:

- Agricultural Equipment Technology
- Field Crops Technology
- Flower and Nursery Crops Technology
- Food Processing, Distribution and Service
- General Agriculture
- Livestock Management and Technology (Dairy and Animal Husbandry Options)
- Pest Control (Agricultural, Urban and Industrial Options)
- Soil Management
- Turfgrass Management

UNDERGRADUATE DEGREES AND OPTIONS LEADING TO DEGREES

Bachelor's degrees of:

Design — environmental design in architecture; environmental design in landscape architecture; and environmental design in product design (including option in visual design).

Bachelor of Science degrees in:

Agriculture and Life Sciences

(Business) — agricultural economics; animal science; horticultural science; and poultry science.

(Science) — agricultural economics; animal science; biological and agricultural engineering; biological sciences (including options in biochemistry, microbiology, and nutrition); botany; conservation; crop science; entomology; food science; horticultural science; medical technology; pest management for crop protection; pre-veterinary option; poultry science; rural sociology (including option in criminal justice); soil science; wildlife biology; and zoology (including options in pre-dental and pre-medical; fisheries and marine biology).

(Technology) — agronomy; animal science; biological and agricultural engineering; food science; horticultural science; and poultry science.

Individualized Study Program in Agriculture and Life Sciences.

Education — agricultural education; industrial arts education; mathematics education; science education (including biology, chemistry, earth science, and physics); secondary education option; technical education; and vocational and industrial education.

Engineering — aerospace engineering; chemical engineering; civil engineering; construction option; electrical engineering; engineering science and mechanics; engineering operations; furniture manufacturing and management; industrial engineering; materials engineering; mechanical engineering; and nuclear engineering.

Forest Resources — forestry; conservation; natural resource recreation management; pulp and paper science and technology; recreation and park administration; and wood science and technology.

Liberal Arts economics; English; history; philosophy and politics.

Physical and Mathematical Sciences

chemistry; computer science; geology; mathematics; meteorology; physics; and statistics.

Textiles textile chemistry; and textile technology.

Bachelor of Arts degrees in:

Education psychology (including options in experimental; human resource development).

Liberal Arts accounting; business management; economics; English (including options in teacher education; writing-editing); French (including option in teacher education); history; multidisciplinary major in liberal arts; philosophy; politics (including option in criminal justice); social studies education option (in economics, history, politics, or sociology); sociology (including option in criminal justice); Spanish (including option in teacher education); and speech-communication (including option in teacher education).

Physical and Mathematical Sciences

geology

Professional degrees (fifth year) in:

chemical engineering; civil engineering; electrical engineering; industrial engineering; materials engineering; mechanical engineering; and nuclear engineering.

GRADUATE DEGREES

Master's degrees of:

adult and community college education, agricultural education, agriculture, architecture, biological and agricultural engineering, biomathematics, chemical engineering, civil engineering, curriculum and instruction, economics, educational administration and supervision, electrical engineering, engineering science and

mechanics, forestry, guidance and personnel services, industrial arts education, industrial engineering, landscape architecture, life sciences, mathematics education, mechanical engineering, occupational education, product design, public affairs, recreation resources, sociology, science education, special education, statistics, technology for international development, textile technology, urban design, vocational industrial education, wildlife biology, wood and paper science.

Master of Arts programs in:

economics, English, history, and politics.

Master of Arts programs in:

adult and community college education, agricultural education, agricultural economics, animal science, applied mathematics, biochemistry, biological and agricultural engineering, biomathematics, botany, chemical engineering, chemistry, civil engineering, crop science, curriculum and instruction, ecology, educational administration and supervision, electrical engineering, engineering science and mechanics, entomology, food science, forestry, genetics, geology, guidance and personnel services, horticultural science, industrial arts education, industrial engineering, marine sciences, materials engineering, mathematics, mathematics education, mechanical engineering, microbiology, nuclear engineering, nutrition, occupational education, operations research, physics, physiology, plant pathology, poultry science, psychology, recreation resources administration, rural sociology, science education, soil science, special education, statistics, textile chemistry, textile technology, vocational industrial education, wildlife biology, wood and paper science, and zoology.

Doctor of Philosophy programs in:

animal science, applied mathematics, biochemistry, biological and agricultural engineering, biomathematics, botany, chemical engineering, chemistry, civil engineering, crop science, economics, electrical engineering, engineering science and mechanics, entomology, fiber and polymer science, food science, forestry, genetics, horticultural science, industrial engineering, marine sciences, materials engineering, mathematics, mathematics education, mechanical engineering, microbiology, nuclear engineering, nutrition, operations research, physics, physiology, plant pathology, science education, sociology, soil science, statistics, wood and paper science, and zoology.

Doctor of Education programs in:

adult and community college education, curriculum and instruction, educational administration and supervision, guidance and personnel services, industrial arts education, and occupational education.

Consult the Graduate Catalog for further information on graduate programs and admissions procedures.

Admissions

Applicants for admission to the University should apply to the Director of Admissions by May 1 for the fall semester and by December 1 for the spring semester. School of Design applications should be submitted by January 1. Each applicant must complete and application form which may be obtained from high school counselors or by writing:

Director of Admissions
Box 5126
North Carolina State University
Raleigh, North Carolina 27607

Located in Peele Hall, the Admissions Office is open Monday through Friday except holidays.

A nonrefundable $10 fee must accompany the completed application when it is submitted to the Director of Admissions. Students of all races are equally welcome at the University.

FRESHMAN ADMISSION

Applicants normally should be graduates of an accredited high school and have the recommendation of the principal or counselor. Non-graduates should usually have a high school equivalency certificate, the minimum high school mathematics preparation, and present other evidence of maturity and ability to deal effectively with college work.

Prospective students should have the following high school credits (courses):

English—4 years

History—2 years

Mathematics—2 years of algebra; 1 year of geometry; advanced algebra and trigonometry is recommended for some programs

Science—2 years, preferably biology, chemistry or physics

Foreign Languages—2 years required for Liberal Arts School only.

Information the University needs for admissions purposes includes: the high school record showing grades through the junior year, a listing of courses in progress in the senior year, a rank in the class based on at least three years of high school study, scores on the Scholastic Aptitude Test (SAT), and the field of study or curriculum preferred.

In addition to adequate high school preparation, applicants must have a freshman Predicted Grade Average (PGA) of at least 1.6 in order to be admitted. This PGA is computed using a formula which takes into consideration the student's class rank in his or her graduating class and scores on the SAT (generally the SAT's should be no less than 800). The rank in class carries greater weight in this prediction than do the SAT scores. A 1.6 grade average is the equivalent of a "C"-minus average on a grading scale where a 4.0 is an "A" and a 2.0 is a "C".

Applicants are accepted on either junior or senior SAT scores, although senior year scores are generally recommended, especially if the applicant is also applying for financial aid. An interview is not required and does not weigh in the admissions decision.

North Carolina State University does not have a specific early decision plan for prospective students now in high school. All applications are acted upon as soon as complete admission credentials are received.

Two-year Agricultural Institute

Requirements for admission to the Agricultural Institute, a two-year terminal program, include graduation from an accredited high school or successful completion of the high school equivalency examination administered by the State Department of Public Instruction. The application should include a copy of the high school record or a letter indicating the applicant has passed the equivalency examination, and a letter of recommendation. Each application is reviewed and evaluated by the Institute Director. SAT scores are not required.

Freshman Class Profile

Who makes up the student body at North Carolina State University? Fifty-five percent of the freshmen who entered in September, 1974, were in the top fifth of their high school graduating class; 85.1 percent, in the top two-fifths. High school performance is the best predictor of success in college; however, applicants who do well on the SAT exams and have "low" high school ranks should not be discouraged from applying for admission. Although 8.6 percent of the N. C. State freshmen in the fall of 1974 ranked in the bottom 50 percent of their high school classes, it is difficult to meet admissions requirements if one is in the bottom half. In 1974-75, the freshman class at N. C. State had average SAT scores of 482, Verbal and 544, Mathematics.

Scholastic Aptitude Test (SAT), Achievement Tests, Advanced Placement

Scholastic Aptitude Test—Applicants for admission as freshmen must take the College Entrance Examination Board Scholastic Aptitude Test (SAT) and request that their scores be sent directly from the Board to North Carolina State University (Code No.—R5496). Information booklets and application forms may be obtained from school counselors or by writing:

College Entrance Examination Board
Box 592
Princeton, New Jersey 08540

Achievement Tests—Achievement Test scores are not used in the admissions decision; however, freshmen who take the English and Math Level I Achievement Tests will receive more accurate placement in the beginning English and math courses. The Biology Achievement Test is especially important for students entering biological sciences. The January test date is considered the best time for taking these tests.

Advanced Placement—A student may qualify for advanced placement by one or more of the following means: 1) by passing a proficiency examination administered by a teaching department; 2) by attaining a sufficient predicted grade in English (PGE) which is based on the SAT Verbal score and either the high school record or the CEEB English Achievement score; 3) by attaining a sufficient predicted grade in mathematics (PGM) which is based on the SAT Mathematics score and either the high school record or the CEEB Mathematics achievement score; 4) by meeting a specific minimum score on certain of the CEEB Advanced Placement Program (APP) examinations; and 5) by attaining at least a minimum score on certain of the College Level Examination Program (CLEP) tests.

OUT-OF-STATE STUDENTS

Undergraduate applicants from outside North Carolina must generally meet higher standards than required of N. C. residents before admission will be granted. North Carolina State University is limited to accepting not more than 15 percent of total undergraduate admissions from outside the State.

TRANSFER STUDENTS

North Carolina State University welcomes transfer applicants; and in recent years, more than 25 percent of our graduates started their college programs at other institutions.

All transfer applicants must have an overall "C" average on all college-level work taken at accredited institutions and must be eligible to return to the last institution regularly attended. At least 28 semester hours of "C" work are required, or the applicant must meet freshman admissions requirements. Applications of students from non-accredited institutions are reviewed by the Admissions Committee.

Work completed at technical institutes is generally not considered college level; however, after enrolling at North Carolina State University, students from such institutes may take comprehensive examinations in courses in which they feel previous training qualifies them for advanced placement.

If admitted, the prospective transfer student's record will be further evaluated to determine the amount of credit that can be transferred and applied toward degree requirements at N. C. State. This evaluation will be approved by the dean of the school in which the student wishes to enroll. *Transcripts are not evaluated however until the applicant has been admitted.* A nonrefundable $2 transcript evaluation fee, payable to North Carolina State University, is charged for this service.

ADDITIONAL CLASSIFICATIONS

Unclassified Students—An unclassified student is one who has been approved for admission to a specific school and is earning college credit but has not chosen a specific curriculum. They must meet the same admissions requirements as regular students. If, at a later date, an unclassified student wishes to change to regular status, credits must be evaluated for his or her chosen curriculum.

Special Students—The special student classification is primarily designed for students 18 years of age or older who are employed in the Raleigh area, including homemakers and other mature individuals interested in college courses for special reasons, but who do not desire to work toward a degree at North Carolina State University. The usual college admissions requirements may be waived for qualified special students, but regular rules of scholarship apply after admission. A maximum of seven hours per semester may be taken by "special" students.

Special student applications should be made through the Division of Continuing Education, Room 134, 1911 Building. If special students wish to change to regular status at a later date, they must make regular application through the Admissions Department and meet the same admissions requirements as other degree candidates.

Auditors—New students desiring admission as auditors should also apply through the Division of Continuing Education. Auditors receive no college credit; however, they are expected to attend classes regularly. Auditor participation in class discussion and in examinations is optional with the instructor.

USAFI CREDITS, COLLEGE LEVEL EXAMINATION PROGRAM

USAFI—College level courses offered by accredited institutions and made available to military personnel through the United States Armed Forces Institute will be considered for transfer credit if a grade of "C" or better has been earned and if the courses are applicable to the student's curriculum. A transcript must be sent to the Director of Admissions directly from the institution offering the course.

College Level Examination Program—CLEP primarily serves non-traditional students who have acquired knowledge through University extension courses, educational television, non-credit adult education programs, on-the-job training, and independent study by enabling them to demonstrate their knowledge and receive college credit on the basis of examinations.

There are two types of examinations, General Examinations and the Subject Examinations. Although only a limited amount of credit is given for the General Examinations, most Subject Examinations are accepted for credit. The examinations are given at N. C. State during the third week of each month, and candidates should register three weeks before the test date.

For further information write or telephone the Counseling Center, North Carolina State University, Box 5505, 210 Peele Hall, Raleigh, N. C. 27607; (919) 737-2424.

GRADUATE STUDENTS

All students working toward graduate degrees or who are taking courses for

graduate credit which are to apply ultimately to a graduate degree are enrolled in the Graduate School. Procedures and policies governing graduate admission are outlined in a special catalog issued by the Graduate School. For a copy of the Graduate School catalog contact:

Dean of the Graduate School
104 Peele Hall
North Carolina State University
Raleigh, North Carolina 27607

READMISSIONS

See readmissions procedures, page 28.

Registration

Preregistration—To preregister a student meets with his or her adviser to discuss an academic program and to select courses for the next semester. The courses selected by each student are processed through the computer which assigns a day and an hour for each course requested. During the registration period at the beginning of each semester, the student obtains a completed class schedule. Schedule of Courses booklets are available for every semester and they contain all necessary instructions for completing preregistration. To be preregistered, a student must submit a Preregistration Schedule Request form to the Office of Registration and Records during the specified preregistration period.

Registration—Registration consists of three steps: 1) paying tuition and fees—preferably by mail, 2) completing registration forms, and 3) obtaining class schedules. Students who register late must follow late registration instructions and pay the required late fees. Instructions for completing registration and late registration are issued each semester and summer session.

Each student is expected to complete registration *in person*. Under no circumstances is a preregistered student considered officially registered until such time as the student has picked up a class schedule and completed the registration forms.

INTERINSTITUTIONAL REGISTRATION

A regularly enrolled full-time degree student at North Carolina State University may take course work at one of the Raleigh colleges, at the University of North Carolina at Chapel Hill, at the University of North Carolina at Greensboro or at Duke University. Interinstitutional registration forms and all registration procedures are available from Registration and Records.

SCHEDULE CHANGES—DROPS AND ADDS

Courses may be added during the first week of a regular semester; courses may be dropped up until two weeks past mid-semester without grades for these courses appearing on the student's permanent academic record. After that time no courses may be dropped. If a student is enrolled for only one course and wishes to drop it, the procedure is that of withdrawal from the University.

Tuition and Fees

North Carolina Resident—$243.75 per semester ($165 tuition plus $78.75 fees)

Nonresident—$1,016.75 per semester ($938 tuition plus $78.75 fees)

A statement of tuition and fees is mailed to each preregistered student around 30-40 days before the beginning of any semester. The statement must be returned with full payment or complete financial assistance information by the due date appearing on the statement. Normally the due date is approximately one week before classes begin. Fees are the same for both residents and nonresidents and are required of all regularly enrolled students. Nonresident students are required to pay an additional $773.00 per semester for tuition. A few non-preregistered students pay their tuition and fees at registration.

ESTIMATED ANNUAL UNDERGRADUATE EXPENSES

	Fall Semester	*Spring Semester*	*Year*
Tuition and fees—N. C. Resident	$ 243.75	$ 243.75	$ 487.50
(Nonresident)	(1,016.75)	(1,016.75)	(2,033.50)
Room Rent	160.00	160.00	320.00
Board (estimated)	387.50	387.50	775.00
Books and Supplies (estimated)	75.00	75.00	150.00
Other Personal Expenses (estimated)	200.00	200.00	400.00
Total—N. C. Resident	$1,066.25	$1,066.25	$2,132.50
(Nonresident)	($1,839.25)	($1,839.25)	($3,678.50)

NOTE: All charges are subject to change without notice.

Expenses Other Than Tuition and Fees

Application Fee—A nonrefundable fee of $10 must accompany each application for admission. Transfer students must pay an additional $2 ($12 total) as a transcript evaluation fee.

Room Rent—New incoming students receive a room application card with payment instructions in the letter of acceptance. Continuing students are provided a card with instructions at their residence hall rooms.

Board—Meals are paid for individually at the various dining facilities available both on and near the campus.

Books and Supplies—Books and supplies are usually purchased during the first week of classes often directly from the Students Supply Store.

Personal Expense—Personal expenses vary widely among students but the yearly estimate of $400 is based on what students have told us they spend on these items.

REFUND POLICY

A student who officially withdraws from school during the first two weeks of classes will receive a tuition and fees refund of the full amount paid less a registration fee. The withheld registration fee amounts to $15 the first week and $25 the second week. After the two week period, no refunds will be made.

In some instances circumstances justify the waiving of rules regarding refunds. An example might be withdrawal from the University because of sickness. Students have the privilege of appeal to the Refund and Fees Committee when they feel special consideration is merited. Applications for such appeals may be obtained from the Office of Business Affairs or the Division of Student Affairs.

An itemization of required fees and other detailed information concerning expenses or related data can be obtained by contacting the Office of Business Affairs, P. O. Box 5067, Raleigh, North Carolina 27607 (Phone 919—737-2986).

RESIDENCE STATUS FOR TUITION PAYMENT

To be considered for in-state tuition the applicant must have maintained a legal domicile for 12 months prior to classification or reclassification as a resident. In order to be eligible for such classification, the individual must establish that his or her presence in the State during such 12 month period was for purposes of maintaining a bona fide domicile rather than for purposes of mere temporary residence incident to enrollment in an institution of higher education. Further 1) if the parents (or court-appointed legal guardian) of the individual seeking resident classification are (is) bona fide domiciliaries of this State, this fact shall be prima facie evidence of domiciliary status of the individual applicant and 2) if such parents or guardian are not bona fide domiciliaries of this State, this fact shall be prima facie evidence of non-domiciliary status of the individual.

No person shall lose in-state resident status by serving in the armed forces outside of the State of North Carolina.

Questions concerning residency should be addressed to the Director of Admissions. University regulations concerning the classification of students by residence, for purposes of applicable tuition differentials, are in *A Manual to Assist the Public Higher Education Institutions of North Carolina in the Matter of Student Residence Classification for Tuition Purposes.* Copies are available at the Admissions Office, 112 Peele Hall.

Financial Aid

Entering students may gain consideration for all types of assistance, except initial consideration for the James M. Johnston Scholarships, by obtaining Parents' Confidential Statement forms from their high school, having their parents complete the forms and submitting them to the College Scholarship Service in Princeton, New Jersey, preferably before February 1 of the year of expected fall enrollment. The Financial Aid Office at North Carolina State University receives from College Scholarship Service a copy of the Parents' Confidential Statement and a

financial need analysis report for each applicant. These data aid in determining the amount of assistance offered by the University.

Awards are made to applicants on the basis of financial need, good citizenship and admission to the University. These awards usually offer combinations of scholarship or grant, loan and/or work-study job, depending upon the degree of need. Aid is available on a non-discriminatory basis to all qualifying students.

Upperclassmen must apply for financial aid each year, preferably by February 1. Continuing students must have a satisfactory record of achievement and citizenship.

SCHOLARSHIPS

Scholarship awards are competitive and are given to those applicants who most nearly meet the selection criteria specified by each scholarship. In addition to high academic potential and achievement, good character and financial need, many awards have curricular, geographic or other restrictions or preference specifications.

GRANTS

Basic Educational Opportunity Grants—The Education Amendments of 1972 authorized the Basic Educational Opportunity Grants. This program is expected to provide awards of up to $1,400 for each undergraduate year. The grant cannot exceed the need of the student nor can it be for more than 50 percent of the actual cost of attendance at the institution the student is attending. A special application is required and may be obtained from high school counselors, post offices or financial aid offices.

Supplemental Educational Opportunity Grants—Supplemental Educational Opportunity Grants compose one of the federally funded financial aid programs that contributes to the aid resources of the University. Supplemental Educational Opportunity Grants are restricted to student from relatively low-income families, and may range from $200 to $1,500 depending upon the family income. They must be matched in at least equal amounts by other aid, usually long-term loans or work-study jobs. Like scholarships, Supplemental Educational Opportunity Grants are gift assistance, not to be repaid.

ATHLETIC AWARDS

Athletic awards are made upon the recommendation of the Athletic Department to athletes who meet established qualifications. A full athletic award provides tuition, fees, room, meals, books and supplies and $15 per month for laundry and dry cleaning. Awards are available in all sports.

LOANS

National Direct Student Loans—In this federal program students who have been accepted for enrollment or currently enrolled students taking at least half-time course loads and able to demonstrate financial need may borrow a maximum of $5,000 for undergraduate study, with a limit of $2,500 during the first two years.

Graduate students may borrow up to a maximum of $10,000 (including undergraduate loans). The repayment and interest period begins nine months after a student ends his studies. The loans bear interest at the rate of three percent per year and the repayment may be extended over a 10-year period, provided the payments are no less than $30 per month. Preceding graduation or other discontinuation of studies, borrowers in this program are expected to have exit interviews with the loan officer in the Office of Business Affairs to establish a repayment schedule.

Loans on essentially the same terms as the National Direct Student Loan are made from the various University loan funds.

Guaranteed Student Loans—Under the Guaranteed Student Loan Program, students are eligible to apply for loans up to $2,500 for a single year with an aggregate of $7,500 for undergraduate students and $10,000 for graduate and professional students (including undergraduate loans). These loans are made by private lenders in the state of the student's residence. Procedures are different in each state. In North Carolina most loans are made through College Foundation, Inc., an agency insured by the State Education Assistance Authority. For College Foundation applications and information about loans available to students from other states consult the Financial Aid Office in Peele Hall.

Emergency Loans—Small short-term loans are available to meet unexpected expenses. These loans must be repaid in 30 to 60 days and are not extended beyond the end of a term or graduation.

COLLEGE WORK STUDY

The federally supported work study program provides jobs for students enrolled on at least a half-time basis who are in need of the earnings to pursue a course of study. During the academic year, employment under the Work Study Program is mostly on campus.

PART-TIME EMPLOYMENT

The Financial Aid Office operates an employment service for all students desiring part-time work while attending school. Jobs are available on and off campus and are not necessarily based on financial need. A list of current job openings is available at the Financial Aid Office.

Student Housing

North Carolina State University furnishes housing for approximately 6,330 students. The University operates 16 residence halls which house 4,089 men and 1,461 women students. In addition, 300 apartments are available for married students and 12 University-owned fraternity houses accommodate 480 fraternity members.

RESIDENCE HALLS

The residence halls are operated to provide opportunities through a variety of group living experiences which will complement and expand the residents' educational experiences. Each hall is staffed with selected students, both graduate and undergraduate, who are responsible directly to professionally trained people in their area and to the Director of Residence Life. Staff members are available to help students initiate programs and activities and to advise and assist residents in any way possible.

Living arrangements in buildings vary. Six high-rise buildings are arranged in suites of four or five rooms sharing a bath; the other buildings have a center corridor with rooms opening on to it. Rooms are furnished but residents must provide bed linen, pillows and towels. (See page 32 for linen and blanket rental.)

To be eligible for University housing one must enroll as a regular full-time student (an undergraduate must carry a minimum of 12 credit hours per semester).

Room Rentals and Reservations—All rooms rent for $160 per semester; this rate is subject to change on a year to year basis. Reservation cards are mailed with the letter of acceptance for admission to the University. These reservation cards and the check for the rent must be returned to the Office of Business Affairs in accordance with the dates established by the Housing Rental Office before room assignments can be made.

Refund of Room Rent—If a room reservation is cancelled at the Residence Life Office, Leazar Hall, in person or in writing on or before July 1 for fall semester and December 15 for spring semester (the date of cancellation is the date notification is received by that office), the rent paid will be refunded less a $10 reservation fee, which is nonrefundable if a student is eligible to register. Between July 1 (for fall semester) and the last day to withdraw with tuition refund, no refund will be made for any reason other than failure to register or official withdrawal from the University. During these times and for the above stated reasons, the rent paid will be refunded less the $10 reservation fee and a prorated daily charge from the first day of classes until the room is vacated. Students who fail to notify the Residence Life Office and who fail to check in and secure their keys on or before 5 p.m. the first day of classes will have their reservation cancelled without refund.

HOUSING FOR MARRIED STUDENTS

The University operates 300 apartments (McKimmon Village) for married students. The rental is $55.00 for an efficiency; $66.00 for a one-bedroom; and $77.00 for a two-bedroom, including water only (gas is included in efficiency units). This rate is subject to change on a year to year basis. Information on availability and applications should be requested from the Department of Residence Life, Box 5072, Raleigh, N. C. 27607.

Raleigh has numerous privately owned apartments and houses available for rent to university students. A partial listing is located in the Housing Rental Office. No listing is published because of the rapid turnover.

The University does not operate a trailer parking area; however, privately owned parks are available within a reasonable distance of the campus.

FRATERNITIES

Seventeen of the 18 social fraternities chartered by the University maintain a chapter house. Twelve of the houses are located on Fraternity Row, a University owned project; the remaining five are located throughout the immediate community. Presently plans are being made for construction of sorority houses on Fraternity Row.

Rental fees vary in fraternity houses depending upon the individual chapter, but are approximately the same as the residence hall rates.

Academic Regulations

CLASSIFICATION OF STUDENTS

Regular degree students are classified at the beginning of each semester and summer session. The required number of hours of each classification is:

Classification	*Semester Hours of Earned Credit*
Freshman (FR)	Less than 28
Sophomore (SO)	28 or more, but less than 60
Junior (JR)	60 or more, but less than 92
Senior (SR)	92 or more

Agricultural Institute students are designated as first (01) year if they have earned less than 28 semester credits and second (02) year if they have earned 28 or more semester credits.

Unclassified students are those working for college credit, but not enrolled in a degree-granting program. Admission as an unclassified student requires the dean's recommendation in the school in which the student wishes to enroll. Unclassified students must meet the same entrance requirements as regular degree students and must meet the same academic requirements to continue.

Special undergraduate students in the various schools are non-degree candidates carrying seven hours (two courses) or less in a semester. Special undergraduates must meet the same academic requirements as regular degree students in order to continue during a semester. Special students on the graduate level are non-degree candidates who are limited in the number of hours they may earn in this classification.

SEMESTER COURSE LOAD AND SPECIAL REQUIREMENTS

The University considers a minimum full-time semester load as 12 credit hours for undergraduates and nine credit hours for graduate students. The maximum load for a semester is 21 credit hours for undergraduates and 15 credit hours for graduate students. To carry more than the maximum, a student must consult his adviser and obtain the approval of his dean or director of instruction. Permission is granted only under extenuating circumstances.

For a regular summer session, a student must have the same approval if he carries more than seven credit hours.

Freshmen English—ENG 111 and 112 are required in all curricula and must be scheduled in successive semesters until completed satisfactorily. Those students who qualify for advanced placement on the basis of previous academic record and performance on the College Board Scholastic Aptitude Test will be given an opportunity to enroll in ENG 112H. Satisfactory completion of the course carries six hours of credit (three hours of credit for ENG 111 "by examination"). The writing laboratory (ENG 200) may not be used to satisfy freshman English requirement.

Physical Education Requirements—Physical education is required of undergraduate students. The duration of required participation varies from a minimum of one year (two semesters) to a maximum of two years (four semesters). The duration of the requirement is determined by the Physical Education Department. Exceptions to the requirement are granted on the basis of the university physician's recommendation.

ACADEMIC ACHIEVEMENT MEASURES

Effective fall 1974 North Carolina State University began using a new grading system for measuring undergraduate academic achievement. Letter grade achievements and quality points are:

Grades	*Definition*	*Quality Points Per Credit Hour*
A	Excellent	4
B	Good	3
C	Satisfactory	2
NC	No Credit	0
S	Satisfactory (Grade for Credit-only course)	
U	Unsatisfactory (No credit grade for Credit-only course)	
IN	Incomplete	
LA	Temporarily Late	
AU	Audit	
NR	No Recognition Given for Audit	

Explanation of Letter Grades

No Credit (NC). The instructor reports to the Registrar that the student is not to receive course credit.

Satisfactory (S). A permanent passing grade used for certain courses approved by the Provost in which *A*, *B*, and *C* are not used; for example, introductory survey courses, research problems, seminars, or special topics.

Unsatisfactory (U). The instructor reports to the Registrar that the student is not to receive course credit for a credit-only course for which the passing grade would be *Satisfactory (S).*

Incomplete (IN). This is a temporary grade. At the discretion of the instructor, a student may be given an *Incomplete (IN)* grade for work not completed because

of a serious interruption in his work not caused by his own negligence. An *IN* grade must be made up by the end of the next semester the student is in residence unless the instructor or teaching department involved is not able to allow the make-up. In the latter case, the instructor or teaching department will notify the student and Registration and Records when the *IN* grade must be made up. The student must not register again for the course while the *IN* grade stands. Any *IN* grade not removed by the end of the next regular semester in residence or during the period specified by the instructor or teaching department will automatically become a *No Credit (NC)* grade and will count as a course attempted.

In the case of a graduating student who has received an *IN* the following procedures apply:

1. If the course *is* needed for graduation, the student will not be allowed to graduate until the work has been made up.
2. If the course is *not* needed, the school dean or director of instruction must, in writing to Registration and Records, give permission for the *IN* to be extended. He should also establish a time limit for completion of the course.

Late (LA). This is a temporary grade used only when grades cannot be reported by the instructor or the teaching department on time.

QUALITY POINT AVERAGE

The number of credit hours officially attempted in a semester or summer session (for which a report of *A, B, C, NC* is received) is divided into the total number of quality points earned (see chart, page 25) to arrive at the Quality Point Average (QPA). The Quality Point Average of work attempted will be computed to three decimal points and used solely for class ranking and academic recognition.

For example, if a student takes 17 credit hours, earning an *A* in two 3-credit courses, a *B* in one 3-credit course and one 2-credit course, a *C* in a 3-credit course and a *NC* in a 2-credit course, the quality point average would be:

6 (credits of *A*)	x 4 (quality points per credit hour)	=	24
5 (credits of *B*)	x 3 (quality points per credit hour)	=	15
3 (credits of *C*)	x 2 (quality points per credit hour)	=	6
2 (credits of *NC*)	x 0 (quality points per credit hour)	=	0
			45

The total number of quality points earned (45) divided by the number of credit hours attempted (17) equals the grade point average, in this case 2.647.

Semester Dean's List—Any full-time undergraduate student who earns a semester average of 3.0 or better on 12 or more hours of course work for which quality points are earned is placed on the semester Dean's List. This achievement is noted on the student's grade report and permanent academic record.

Class Rank—A student's ranking in his class will be determined on the basis of the Quality Point Average and will be indicated on his permanent academic record upon graduation.

GRADE REPORTS

At the end of each semester or summer session Registration and Records issues a grade report showing all grades earned during that grading period.

At registration students will be asked to complete an address form giving a mailing address to which grade reports and other University correspondence will be mailed. Students have the choice of having their grade reports sent to their parents or guardians. However, students may elect to have their grade reports sent directly to themselves.

Change of Name or Address—It is the student's responsibility to inform Registration and Records of any changes in name or address. Failure to do this may prevent prompt delivery of important University correspondence. Also, news stories about Dean's List students are sent to N. C. newspapers based on hometown information furnished Registration and Records.

ACADEMIC RETENTION-SUSPENSION RULES

In order to determine an undergraduate student's eligibility to continue at the University, credit hours passed are divided by the credit hours attempted to determine the percentage of hours passed for each regular semester and summer session. This quotient is also determined on a cumulative basis. When an undergraduate attempts 28 or more credit hours at North Carolina State University, he will be suspended at the end of that semester or summer session, or any semester or summer session thereafter, if he fails to pass 50 percent of the cumulative hours attempted. However, no student will be suspended at the end of a semester in which he has passed 50 percent or more of the hours attempted during that semester. A suspended student is eligible to attend the summer sessions from N. C. State and/or take approved correspondence courses from N. C. State to improve his academic standing. He is eligible for readmission when he raises his percentage of cumulative hours passed to 50 percent of the cumulative hours attempted. There is no limit on the number of summer school periods open to a student trying to earn readmission.

Students who were suspended prior to fall 1974 under the constant quality point deficit system may be allowed to continue by one of the following ways:

1. By having passed 50 percent of all hours attempted with a C or better in accordance with the new Retention-Suspension rules.
2. By appeal to the Admissions Committee as outlined below.

Suspended students who have had a break in residency must file a re-admissions application in addition to a letter of petition.

Appeal of Suspension—The Admissions Committee will consider petitions from suspended students when there are extenuating circumstances. A letter of petition should be written by the student to the Admissions Committee stating:

a. The reason for his academic difficulty, and
b. The reasons why he believes he can now be successful in meeting the University's academic standards and complete all degree requirements within a reasonable length of time.
c. The address to which he wishes the Committee's decision sent.

WITHDRAWAL FROM THE UNIVERSITY

If a regularly enrolled degree student wishes to withdraw from the University (dropping all courses) during a semester or summer session, he initiates the official withdrawal process at the Counseling Center.

Determination of grades and the entry on the permanent academic record for a student withdrawing during a semester depend upon his reasons for withdrawal and the time of withdrawal in the semester. A student who discontinues attendance in all classes without officially withdrawing will receive all *NC* grades.

A student who withdraws after the first two weeks of classes of a semester will receive no refund of tuition and fees, except in unusual cases approved by the Refund Committee. All courses dropped prior to the second week after mid-semester in a semester will not appear on the permanent academic record.

Withdrawal from a semester constitutes a break in the student's residence, and, if the student plans to return, he must file a readmission form even though he may have preregistered for the next academic period.

READMISSION OF FORMER AND SUSPENDED STUDENTS

A *former student returning* is one who a) was not in attendance during the fall or spring semester prior to applying for readmission or b) withdrew from the University during a fall or spring semester. All former students returning, both graduates and undergraduates, must apply for readmission to the Readmissions Office, Registration and Records, P.O. Box 5126, Raleigh, N. C. 27607 at least 30 days prior to the date of desired enrollment.

A student who receives a bachelor's degree must apply for admission to the Graduate School or for readmission as an unclassified or professional student. An undergraduate working toward a second degree must reapply only if there has been a break in residence. Otherwise, only a curriculum change form indicating the desired second major must be submitted to Registration and Records.

Preregistration alone is not sufficient to enable the student to be readmitted.

Regulations

1. A *student who was eligible to continue* at N. C. State at the time of his leaving is eligible to return (except as indicated immediately below). Students in this category need only complete a readmission form.
   a. A student who was eligible to continue at the time of his leaving but who has subsequently taken work at another institution and earned less than a *C* average on such work must complete a readmission form *and* write a letter of petition to the Admissions Committee.
   b. A student eligible to continue at the time of his leaving who has subsequently taken correspondence and/or extension work at N. C. State and earned grades which resulted in suspension must complete a readmission form *and* write a letter of petition to the Admissions Committee.

2. *Suspended Students.* For conditions of suspension, see Academic Retention-Suspension Rules, page 27. For readmission, follow procedures outlined under "Appeal of Suspension."

REPEATING COURSES

A student who repeats a course, regardless of the grade previously made, will have both grades counted in his cumulative quality point average. An undergraduate student is allowed as many semester hours as are appropriate in one's curriculum for courses: 1) titled seminar, special problems, special topics, independent study or research (usually numbered 490-499 or 590-599) 2) covering topics different from those studied when the courses were taken previously. However, for any courses other than one that satisfies these conditions, if a student repeats and passes the course both times, the semester hours will be counted only once toward the number of hours required for graduation.

The adviser's approval is required for a student to repeat any course previously passed. Approval should not be given when a student wishes to repeat a course already passed with a grade of *A* or *B*. Nor should it be given when: 1) a student wishes to repeat a lower division course that he has passed with a grade of *C* or better after having successfully completed an advanced course covering the same material or 2) a student wishes to repeat a lower level course that he has passed with a *C* or better which is a prerequisite for an advanced course that he had already successfully completed.

CREDIT-ONLY COURSES

Each undergraduate student has the option to count toward graduation requirements a maximum of 12 semester hours in the category of "credit-only" courses (exclusive of courses which departments or instructors choose to grade on a Satisfactory-Unsatisfactory basis with the approval of the Provost's Office). The student may select as "credit-only" any course offered by the University except those in Military Science and Aerospace Studies. Selected courses must be included under the free elective category of the specific curriculum in which the student is enrolled. He will be responsible for attendance, assignments, and examinations.

The student's performance in a "credit-only" course will be reported as *S* (Satisfactory grade for credit-only course) or *U* (no credit grade for credit-only course) and will not affect his quality point average. An *S* allows the course credit to be counted toward the student's graduation requirements. "Credit-only" work may drop a student below 12 hours of course work for which quality points are earned and thus make him ineligible for semester Dean's List.

AUDITS

A student wishing to audit a course must have the approval of his adviser and of the department offering the course. Participation in class discussion and in examinations is optional with the instructor. Auditors receive no course credit; however, they are expected to attend classes regularly.

A student who has taken a course for audit may, with his adviser's approval, enroll in the course for credit during a subsequent semester or summer session.

CREDIT BY EXAMINATION

A currently registered undergraduate student (degree, unclassified, or special) desiring to take an examination for course credit in lieu of enrolling or reenrolling for a course must initiate a request with his adviser (except when a teaching department initiates group testing of beginning students for placement purposes and grants credit). If the adviser approves, the student arranges for the examination with the department offering the course. The department may administer the examination in any manner pertinent to the materials of the course. The academic standards for credit by examination will be commensurate with the academic standards for the course.

If the student performs satisfactorily on the examination, the instructor will notify Registration and Records on a late grade report form (pink) by stating, "Credit by Examination". The appropriate number of credit hours is entered on the student's permanent academic record and he is issued a grade report. Credits earned in this manner are considered in the same way as transfer credits and are not used in the computation of the student's quality point average. Registration and Records will post course credit to the permanent academic record only if the student is currently registered unless the student is a graduating senior and this is the only course required for graduation. If the student does not exhibit satisfactory performance, no action beyond notifying the student is required.

CURRICULUM CHANGE

To initiate a curriculum change, a student secures a Curriculum Change Form from the office of his dean or director of instruction, obtains the required signatures, and files the completed form with Registration and Records, preferably by the end of the preregistration period.

From the standpoint of advising, preregistration, and dropping courses, the student is considered to be in the new curriculum as soon as the Curriculum Change Form is completed and filed with Registration and Records, and his records are transferred to his new department.

GRADUATION REQUIREMENTS

A student is scholastically eligible for graduation when he has satisfied all the specific requirements of his department, his school and the University.

Individual departments and/or schools may determine their own limits, if any, of credit hours for off-campus classes and/or correspondence courses.

A transfer student, to be eligible for a bachelor's degree, normally must earn at least 24 of his last 30 hours of credit in residence at N. C. State; however, individual departments and/or schools may waive this guideline and determine their own residency requirements for a bachelor's degree.

Graduation with high honors requires a cumulative Quality Point Average of 3.5 or higher; with honors, 3.0-3.499.

Students satisfactorily completing the requirements for more than one bachelor's degree may, upon the recommendation of their deans, be awarded two bachelor's degrees at the same or at different commencement exercises. To earn two degrees

the student registers in one school or department and, with the cooperation of the second school or department, works out his program to cover the requirements for both. The student must file an approved Curriculum Change form labeled "Second Degree" with Registration and Records.

Students anticipating graduating must file an Application for Degree with Registration and Records the semester prior to such anticipated graduation. Forms are available in any academic departmental office or in Registration and Records.

Presence at graduation exercises is required except when permission for graduation in absentia is granted. Request forms are available from Registration and Records.

TRANSCRIPTS OF ACADEMIC RECORD

A transcript is an exact copy of a student's permanent academic record at the time it is issued. Each student is entitled to one free official transcript of his record. A fee of one dollar is charged for each additional transcript.

No official transcript may be issued to or for a student who is indebted to the University until such indebtedness has been paid or satisfactorily adjusted.

Official transcripts are released only upon the *written* request of the student to Registration and Records, Box 5126, Raleigh, N. C. 27607.

Special Programs

HONORS PROGRAMS

Honors Programs are designed to provide individualized programs of study for promising young scholars. The Schools of Agriculture and Life Sciences, Engineering, Forest Resources, Liberal Arts, Physical and Mathematical Sciences, and Textiles have separate plans built around honors courses, supervised research, and special seminars. Students who demonstrate exceptional ability and achievement during their freshman or sophomore year are eligible to participate. Information is available from faculty advisers and from the office of the dean of each school.

COOPERATIVE EDUCATION PROGRAMS

The Schools of Engineering, Forest Resources, Liberal Arts, Physical and Mathematical Sciences and Textiles offer an optional five-year plan under which students may alternate semesters of work in their professional field with on-campus study during the sophomore and junior years. Students who want to participate in a co-op program should discuss the possibilities with their faculty advisers.

The D. H. Hill Library

The D. H. Hill Library's book and bound journal collection totals almost 700,000 volumes and is particularly strong in the biological and physical sciences, in

engineering, agriculture, and forestry. The arts, humanities, and social sciences are also well represented. The library regularly receives more than 6,500 magazines, journals, and other periodical publications.

Three special collections form on-campus branches of the Hill Library—the Burlington Textiles Library in Nelson Hall containing holdings in textile technology and textile chemistry; the Harrye B. Lyons Design Library in Brooks Hall containing holdings in architecture, landscape architecture, and product design; and the Forest Resources Library and reading room in Biltmore Hall.

The library's collections are open to all students and faculty for over 100 hours per week.

General Information

FOOD SERVICE

Food Service is provided at the University Student Center, the University Student Center Annex and in six campus snack bars. The average cost of food for the academic year is estimated to be $775.

AUTOMOBILES

Every student desiring to park on campus is required to register his vehicle(s) with the Traffic Records Office and pay a registration fee. A booklet of regulations is published and distributed each fall.

No student may register or acquire parking permits for a vehicle not owned by himself, his spouse, a parent, or a guardian. The Chancellor shall have authority to establish the number of vehicles which any student may register and operate pursuant to these regulations. Unless increased by the Chancellor, the number of said vehicles shall be one.

LAUNDRY

The University operates a laundry and dry cleaning facility on campus at reasonable prices. Branch offices are located in the residence halls for the convenience of the students.

LINEN AND BLANKET RENTAL

The linen service provides for the initial issues of two sheets, one pillow case, and three towels. The student may exchange his linen weekly at a cost of $30 per year. Pillows may be rented for $1.50 per year. A regular blanket rents for $5 per year, and the N. C. State monogrammed blanket rents for $7. These services are available to both on- and off-campus students. Application forms for these services will be mailed to each student.

Refunds under the linen rental plan are computed on a semester basis. During a semester, refunds will be computed at a charge rate of $1 for each week the plan has been in use, plus a $4 service charge until $15 is exhausted. Refunds are not available for the weeks a student fails to exchange linen.

HEALTH

North Carolina State University seeks to safeguard the health of the student in every way possible. The University maintains a 60-bed infirmary which is open 24 hours a day. The infirmary is fully staffed by physicians, nurses and auxiliary personnel. Infirmary features include an up-to-date first-aid department and an x-ray department.

The University physicians observe daily office hours at the infirmary in the mornings and afternoons. In addition, they are on call at all times. A registered nurse is on duty day and night. Students have free access to the infirmary at all times except when closed during holiday periods.

In case of accident or serious illness, parents or guardians will be notified. This notice will be made by the attending physician unless expressly forbidden by the student. No operation is performed upon a student under 18 years of age, except in an extreme emergency, without parental permission.

The medical fee paid by each student provides for infirmary service, general medical treatment and the services of nurses. It does not provide for surgical operations, outside hospital care, or the services of dentists or other specialists. Special students and others who have not paid the health fee are not entitled to use the Student Health Service.

Before the student enters N. C. State, he or she should have a complete, thorough examination by the family physician. Any abnormality should be noted and all defects corrected in order to prevent unnecessary loss of time while the student is in college. If the examination is not made before entrance, the student will be given a physical examination at the University, for which a fee is charged. Blanks for the physical examination may be obtained from the Office of Admissions.

The infirmary does not offer its services to dependents of students. Married students are encouraged to enroll in the Student Government Health and Accident Insurance Group Policy which covers dependents.

ACCIDENT AND HEALTH INSURANCE

The University offers annually a plan of student accident and health insurance. The insurance covers the surgical, accident, and hospital needs of the student, as a supplement to the services offered through the infirmary. Each year complete information will be made available to students before school opens.

Foreign students are required to enroll in the accident and health insurance plan provided through the University or to have similar coverage under other insurance plans or arrangements with their sponsors.

ORIENTATION

During the month of June, an orientation program is held for freshmen entering N. C. State for the first time in the fall semester. Freshmen are expected to attend the two-day program that corresponds with their major field of study. In the event an entering freshman cannot attend the summer program in June, a "late" orientation is held in August just prior to the beginning of fall semester.

Transfer students who are entering N. C. State for the first time in the fall semester are encouraged to attend the Transfer Student Orientation Program held on registration day.

Special orientation sessions are held for students who enter in the spring semester or either summer school session.

In addition, the Office of Student Development sponsors an optional orientation program for black students during the fall semester.

COUNSELING

The Counseling Center helps students with problems of adjustment to college life and vocational and curricular choice as well as any other problems a student might wish to discuss. The center administers aptitude and interest tests and maintains a file of occupational information to help guide students in career selection. The center offers psychiatric evaluation and marriage counseling, provided by part-time specialists who augment the center staff. Students may come to the center on their own accord, or they may be referred by teachers, advisers or other members of the University staff.

FACULTY ADVISERS

At North Carolina State University the primary responsibility for planning an academic program and meeting graduation requirements rests with the student. In order that information and assistance be available when needed, each regular degree student is assigned to a faculty adviser who is usually in the student's major field of study.

School and department coordinators of advising, deans, directors of instruction, department heads, and members of the faculty keep office hours and expect students to consult them individually whenever necessary.

FOREIGN STUDENT AND STUDY ABROAD ADVISING

The foreign student and study abroad adviser offers assistance to foreign students and faculty with visas, passports, currency permits, tax information, and medical, personal and social problems.

All foreign students are required to take an International Student Orientation course (ISO-100) to acquaint them with University procedures and the practical problems of living in the United States.

Any student desiring information on travel and study abroad may use the facilities of this office. International Student ID Cards may be purchased by qualifying full-time students.

CAREER PLANNING AND PLACEMENT CENTER

The Career Planning and Placement Center offers assistance to all students at North Carolina State University at all degree levels. Service is available on a year round basis. Advice on the relationship of personal career goals to various programs of study and assistance in the identification of individual aptitudes

and abilities affecting career potential are available. Aptitude and interest testing is a Counseling Center service to which students are often referred in the initial stages of their career planning. Students are urged to take advantage of the career planning service in the early years on campus.

This office arranges and coordinates job interviews between students and employer representatives. Seniors are urged to use this placement service for interviewing with potential employers. The staff also recommends contacts with employers not scheduled to visit the campus, and will advise students of job opportunities given to the center by mail or telephone.

COOPERATING RALEIGH COLLEGES

Cooperating Raleigh Colleges is a consortium, or voluntary organization, comprised of North Carolina State University, Meredith College, Peace College, St. Augustine's College, St. Mary's College and Shaw University. The organization promotes interinstitutional cooperation and cooperative educational activities among the six institutions. Agreements provide the opportunity for any student to enroll at another institution for a course or courses not offered on one's home campus.

Student Activities

North Carolina State University makes every effort to provide the student with surroundings which are pleasant and conducive to intellectual growth. Respecting the student as an individual, the University assures him or her the maximum of personal liberty within the limits necessary for orderly progression of class work. In return, the student is expected to pay serious attention to his or her purpose in attending this University and to observe rules of conduct consistent with maturity. Through the various services and activities identified with everyday life on campus, as well as through the several extracurricular organizations and functions, the student at N. C. State has an opportunity for acquiring experience in group leadership and community living which may serve one well in one's professional career.

STUDENT BODY GOVERNMENT AND STUDENT JUDICIAL SYSTEM

When a student enters North Carolina State University, they become a member of a self-governing community. Legislative, executive and judicial authority, insofar as student affairs are concerned, rest with the student body government which operates within the framework of over-all University administration. The student body government members and judicial department members are elected in campus-wide elections.

During each registration period, students are asked to sign either an honor code pledge or a recognition of academic integrity statement. These statements reflect the emphasis that N. C. State student government places upon academic integrity.

CLUBS AND SOCIETIES

Honorary—Honorary societies at N. C. State are Golden Chain, senior leadership; Blue Key, junior leadership; Thirty and Three, sophomore leadership; Phi Eta Sigma, men's freshman scholarship; Alpha Lambda Delta, women's freshman scholarship; and Phi Kappa Phi, junior, and senior and graduate students scholarship.

Professional and Technical—Each school at N. C. State sponsors or supervises a large number of professional and technical societies and clubs. Students in every area of instruction are encouraged to join with their fellow students in pursuing their common interests. Many of these organizations contribute greatly to the student's professional and social growth.

Social Fraternities and Sororities—Eighteen national social fraternities have chapters at State.

The social fraternities at N. C. State are Alpha Gamma Rho, Alpha Phi Alpha, Delta Sigma Phi, FarmHouse, Kappa Alpha, Kappa Sigma, Lambda Chi Alpha, Phi Kappa Tau, Pi Kappa Alpha, Pi Kappa Phi, Sigma Alpha Epsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Sigma Pi, Tau Kappa Epsilon and Theta Chi.

State also has two national social sororities, Sigma Kappa and Alpha Delta Pi.

STUDENT PUBLICATIONS

A variety of publications, both general and school-sponsored, are edited and managed by student officers, with faculty members serving as advisers. A student may gain journalistic experience and training in writing, editing or management by working on these publications.

The three general publications, The *Agromeck*, WKNC-FM, and the *Technician*, are supported in large part by a publication fee included in each student's fees.

The *Agromeck* is the University yearbook, providing a record of the senior class and of the principal events of the school year. The yearbook recalls in pictures the varied activities of the student body through the year, and is published for the entire student body.

The *Technician* is the student newspaper issued three mornings a week.

Although it is not a publication in the strictest sense of the word, WKNC-FM serves the same function through a different medium. It offers opportunities for extracurricula training in broadcasting techniques as well as training in administration and program planning.

Each student receives a copy of the current handbook, which contains detailed information about student organizations, activities, and policies.

Several of the schools have their own publications issued under the general supervision of the particular school and dealing with material of special interest to students in that school. These publications and the school they represent include *Agri-Life*, Agriculture and Life Sciences; the *Pi-Ne-Tum*, Forest Resources; *The Southern Engineer*, Engineering; *The Textile Forum*, Textiles; *The Publica-*

tions of the School of Design; and *The Scientist*, Physical and Mathematical Sciences.

ATHLETICS

North Carolina State University offers a variety of athletic activities. In addition to voluntary programs of intramural and intercollegiate sports, freshmen and sophomores are required to take two to four semesters of physical education. Juniors and seniors take physical education as an elective.

Intercollegiate—The Department of Athletics conducts the University's intercollegiate athletics program involving 14 varsity sports.

The athletics program is administered by the Athletics Director with the Athletics Council, made of seven faculty, three alumni and three students, functioning to exercise institutional responsibility and control of the intercollegiate athletics program. The program is self-sufficient and is operated through gate receipts and student fees. Athletics grants-in-aid are provided through the North Carolina State Student Aid Association (Wolfpack Club).

The University facilities include double-decker Carter Stadium, featuring 41,000 sideline seats, Reynolds Coliseum holding 12,000 for basketball, and Doak Field having 3,800 seats for baseball. A nine-lane tartan track and a 2,200 seat swimming stadium, with a twenty-five yard by twenty-five meter pool, are also available.

Intramurals—The University maintains a program of intramural sports which is administered by the Department of Physical Education. Intramural activities are divided into three basic programs: traditional sports, sports clubs, and annual events.

In the traditional sports program individual and team sports are offered to both men and women with participation being voluntary. Competition is divided into four divisions: 1) residence halls 2) fraternity 3) open and 4) women. Thirteen sports are offered in the residence hall and fraternity divisions, while 11 sports are offered in the open division. In the women's division competition is offered in 13 different activities.

MUSICAL ORGANIZATIONS

Since the early days of North Carolina State, musical organizations have played an important part in campus life presenting concerts, furnishing music for official university functions and performing at athletic events. The combined membership of these organizations constitutes the largest voluntary student organization on campus. Students may join the bands, choral organizations, orchestras, and pipes and drums by reporting for an audition at the time and location indicated in the orientation schedule. Rehearsals are arranged to avoid conflicts with study time or classes. Membership in all musical organizations is open to any regularly enrolled student.

Bands—The Symphonic Band, the Fanfare Band, the Brasschoir Band and the Marching Band make up the four divisions of the N. C. State bands. Each band serves a specific purpose and assignments are made according to individual

interests and abilities. The Symphonic, Fanfare and Brasschoir Bands are concert organizations, with the Symphonic Band having the most rigid requirements.

Choral Groups—The two divisions of the N. C. State Choral program are the Varsity Men's Glee Club and the University Choir. Placement in these organizations is according to individual abilities and interest. The Varsity Men's Glee Club is by history and tradition the prime choral group on campus and maintains the higher entrance requirements. The Varsity and the Choir present several concerts each year, both on and off the campus as well as making radio and television appearances, recordings, tours and providing small ensembles for special occasions. For those interested in additional study of singing techniques, a Voice Guild is offered.

Orchestras—A wide range of orchestral music is read and performed. Placement in the North Carolina State University Symphony Orchestra is according to individual interest and ability. Several concerts are presented each year on and off campus providing an opportunity to coordinate musical efforts with professional musicians, recognized locally and nationally. Provisions are made for those with an interest in string quartet and other small ensemble experience.

NCS Pipes and Drums—The newest musical organization at N. C. State is a highland bagpipe group. Students learn an instrument known to many of North Carolina's early settlers and represent the university through a unique and distinctive medium. The organization performs at university and community functions. Pipes and drums are provided. No piping experience is necessary.

Musician-in-Residence—N. C. State established this special chair in the Department of Music to facilitate the University's cultural development. Internationally known performers are appointed to the Musician-in-Residence position on a rotating basis.

THOMPSON THEATRE

Thompson Theatre is student oriented and maintained. Each production has opportunities for new student talent and "old theater hands." Each production is open to new actors and technical crew and staffs. Technical interest is required in scenic, costume and lighting design.

The theater itself was conceived and built as an experimental theater. Removable wall and ceiling panels allow flexibility. Seating can be intimate for arena and proscenium productions or large groups can be accommodated for pageant and spectacle.

The studio is a small version of the main theater seating about 80 people. It is available to all state students for production of experimental plays with minimal supervision. About six show dates per year are available with those involved in the directing workshop having first priority. Studio use is approved by the theater executive committee.

University Players is an honorary organization composed of students who have gained recognition in the theater. The club assumes responsibility for many aspects of the working theater from budget to production. It sponsors a banquet and Hammy awards for outstanding theater work.

UNIVERSITY STUDENT CENTER

The new University Student Center houses the major student organizations: Student Government, the *Technician*, WKNC-FM/WPAK, the *Agromeck*, the Inter-Residence Council, the Inter-Fraternity Council and the University Student Center Activity Board. It provides reading lounges, galleries, a newsstand and TV lounge, meeting rooms, a cafeteria on the top floor, a delicatessen and snack bar on the first floor, an ice cream bar, ballroom, games room and 816-seat theater.

In the Thompson building the Center also operates one of the best equipped craft shops in the Southeast. It offers a wide variety of crafts, including ceramics, photography, weaving, woodworking, and textile printing. Both opportunities for instruction and individual work are available.

The University Student Center Annex in the Erdahl-Cloyd Wing of the D. H. Hill Library houses a snack bar, barbershop, billiards room and newsstand.

The University Student Center sponsors a wide variety of programs including amateur and professional theatrical productions, pop and classical concerts, lectures, films, art shows, dances, international fairs, volunteer services and instruction in a wide variety of crafts.

The Coordinator of Religious Affairs is housed in the University Student Center. He sponsors, in cooperation with the YMCA and various chaplains assigned to the University, a wide range of activities from chapel services and seminars to multi-media productions.

University Calendar*

SPRING SEMESTER, 1975

January 13	Mon.	All students complete registration
January 14	Tues.	Change day (late registration, drop/add)
January 15	Wed.	First day of classes
January 22	Wed.	Last day to add a course
January 29	Wed.	Last day to withdraw (or drop a course) with refund
March 7	Fri.	Mid-term reports due; spring vacation begins (10 p.m.)
March 17	Mon.	Classes resume (8 a.m.)
March 21	Fri.	Last day to drop a course without a grade
March 31	Mon.	Holiday
May 2	Fri.	Last day of classes
May 3-4	Sat.-Sun.	Reading days
May 5-14	Mon.-Sat.	
	Mon.-Wed.	Final examinations
May 17	Sat.	Commencement

* The calendar is tentative, subject to approval or change by the Board of Trustees.

SUMMER SESSIONS, 1975

First Session

May 20	Tues.	Registration day
May 21	Wed.	First day of classes
May 26	Mon.	Last day to register; last day to withdraw (or drop a course) with a refund
June 6	Fri.	Last day to drop a course without a grade
June 24	Tues.	Last day of classes
June 25	Wed.	Final examinations

Second Session

June 30	Mon.	Registration day
July 1	Tues.	First day of classes
July 4	Fri.	Holiday
July 7	Mon.	Last day to register; last day to withdraw (or drop a course) with a refund
July 18	Fri.	Last day to drop a course without a grade
August 5	Tues.	Last day of classes
August 6	Wed.	Final examinations

FALL SEMESTER, 1975

August 25	Mon.	All students complete registration
August 26	Tues.	Change day (late registration, drop/add)
August 27	Wed.	First day of classes
September 1	Mon.	Holiday
September 3	Wed.	Last day to add a course
September 10	Wed.	Last day to withdraw (or drop a course) with a refund
October 17	Fri.	Mid-term reports due
October 31	Fri.	Last day to drop a course without a grade
November 26	Wed.	Thanksgiving vacation begins (1 p.m.)
December 1	Mon.	Classes resume (8 a.m.)
December 5	Fri.	Last day of classes
December 6-7	Sat.-Sun.	Reading days
December 8-17	Mon.-Sat. Mon.-Wed.	Final examinations

SPRING SEMESTER, 1976

January 12	Mon.	All students complete registration
January 13	Tues.	Change day (late registration, drop/add)
January 14	Wed.	First day of classes

January 21	Wed.	Last day to add a course
January 28	Wed.	Last day to withdraw (or drop a course) with a refund
March 5	Fri.	Mid-term reports due; spring vacation begins (10 p.m.)
March 15	Mon.	Classes resume (8 a.m.)
March 19	Fri.	Last day to drop a course without a grade
April 19	Mon.	Holiday
April 30	Fri.	Last day of classes
May 1-2	Sat.-Sun.	Reading days
May 3-12	Mon.-Sat. Mon.-Wed.	Final examinations
May 15	Sat.	Commencement

SUMMER SESSIONS, 1976

First Session

May 18	Tues.	Registration day
May 19	Wed.	First day of classes
May 24	Mon.	Last day to register; last day to withdraw (or drop a course) with a refund
June 4	Fri.	Last day to drop a course without a grade
June 22	Tues.	Last day of classes
June 23	Wed.	Final examinations

Second Session

June 28	Mon.	Registration day
June 29	Tues.	First day of classes
July 2	Fri.	Last day to register; last day to withdraw (or drop a course) with a refund
July 5	Mon.	Holiday
July 16	Fri.	Last day to drop a course without a grade
August 3	Tues.	Last day of classes
August 4	Wed.	Final examinations

FALL SEMESTER, 1976

August 30	Mon.	All students complete registration
August 31	Tues.	Change day (late registration, drop/add)
September 1	Wed.	First day of classes
September 6	Mon.	Holiday
September 8	Wed.	Last day to add a course
September 15	Wed.	Last day to withdraw (or drop a course) with a refund

October 22	Fri.	Mid-term reports due
November 5	Fri.	Last day to drop a course without a grade
November 24	Wed.	Thanksgiving vacation begins (1 p.m.)
November 29	Mon.	Classes resume (8 a.m.)
December 10	Fri.	Last day of classes
December 11-12	Sat.-Sun.	Reading days
December 13-22	Mon-Sat.	
	Mon.-Wed.	Final examinations

SPRING SEMESTER, 1977

January 10	Mon.	Opening Day (counseling, advising, new student orientation, etc.)
January 10	Mon.	All students complete registration
January 11	Tues.	Change day (late registration, drop/add)
January 12	Wed.	First day of classes
January 19	Wed.	Last day to add a course
January 26	Wed.	Last day to withdraw (or drop a course) with a refund
March 4	Fri.	Mid-term reports due; spring vacation begins (10 p.m.)
March 14	Mon.	Classes resume (8 a.m.)
March 18	Fri.	Last day to drop a course without a grade
April 11	Mon.	Holiday
April 29	Fri.	Last day of classes
April 30-May 1	Sat.-Sun.	Reading days
May 2-11	Mon.-Sat.	Final examinations
	Mon.-Wed.	
May 14	Sat.	Commencement

SCHOOLS AND PROGRAMS OF STUDY

There are eight major undergraduate academic divisions at North Carolina State University. These are the Schools of Agriculture and Life Sciences, Design, Education, Engineering, Forest Resources, Liberal Arts, Physical and Mathematical Sciences and Textiles. The programs of study are outlined by school. Information concerning specific courses is given in the section of the catalog on course descriptions.

In addition to information about the schools, this section contains descriptions of the military training program (ROTC), the Graduate School, Continuing Education and Summer Sessions.

Throughout the programs of study given in this section, departmental codes, course numbers and course titles are used. The key to the departmental code follows. This key will aid in locating individual courses in the course description section.

Code	Name
AC & ALS	Agriculture and Life Sciences (General Courses)
ACC	Accounting
ANS	Animal Science
ANT	Anthropology
ARC	Architecture
ART	Art
AS	Aerospace Studies (ROTC)
BAE	Biological and Agricultural Engineering
BCH	Biochemistry
BMA	Biomathematics
BO	Botany
BS	Biological Sciences
CE	Civil Engineering
CH	Chemistry
CHE	Chemical Engineering
CS	Crop Science
CSC	Computer Science
DN	Design
E	Engineering (General Courses)
EC	Economics
ED	Education (General Courses)*
EE	Electrical Engineering
EH	Engineering Honors
ENG	English
ENT	Entomology
EO	Engineering Operations
ESM	Engineering Science and Mechanics
FOR	Forest Resources**
FS	Food Science
GN	Genetics
GRK	Greek
GY	Geology
HI	History
HS	Horticultural Science
IA	Industrial Arts
IE	Industrial Engineering
ISO	International Student Orientation
LA	Liberal Arts
LAR	Landscape Architecture
LAT	Latin
MA	Mathematics
MAE	Mechanical and Aerospace Engineering
MAS	Marine Sciences
MAT	Materials Engineering
MB	Microbiology
MLE	English (Foreign Students)
MLF	French
MLG	German
MLI	Italian
MLR	Russian
MLS	Spanish
MS	Military Science (ROTC)
MUS	Music
MY	Meteorology
NE	Nuclear Engineering
NTR	Nutrition
OR	Operations Research
OY	Physical Oceanography
PD	Product Design
PE	Physical Education
PHI	Philosophy
PHY	Physiology
PMS	Physical and Mathematical Sciences (General Course)
PO	Poultry Science
PP	Plant Pathology
PS	Politics
PSY	Psychology
PY	Physics
REL	Religion
RRA	Recreation Resources Administration
SOC	Sociology
SP	Speech
SSC	Soil Science
ST	Statistics
T	Textiles (General Courses)
TC	Textile Chemistry
TOX	Toxicology
TX	Textile Technology
UD	Urban Design
UNI	University Studies
VET	Veterinary Science
WPS	Wood and Paper Science and Technology
ZO	Zoology

*This includes courses offered by all departments and programs within the School of Education except industrial arts and psychology which are coded separately.

** This includes conservation and forestry.

AGRICULTURE AND LIFE SCIENCES

Patterson Hall

J. E. Legates, *Dean*
E. W. Glazener, *Associate Dean and Director of Academic Affairs*

Modern agriculture is a complex industry built on the principles of science and business. The basic sciences are the foundations for modern agricultural technology. These sciences applied to understanding the functions of living material offer a background as preparation for a professional agriculturist, environmentalist, or as a preparatory program for the medical and health related sciences. Likewise, the principles of economics and sociology provide background preparation for agricultural business management and public service aspects of society.

The objects of the academic program are:

1) To provide an opportunity for a broad university education.
2) To provide a variety of learning experiences.
3) To offer a choice of specialization, sufficient for initial employment.
4) To provide background for graduate or professional programs.

A high percentage of all the gainfully employed persons in the United States are engaged in operations directly or indirectly related to food and fiber. For example, the food industry ranges from those who produce the food, supply material to the producer, and process the finished product to those who sell the products to the consumer. Hundreds of distinct occupations are represented in modern agriculture and biology. About 30 percent of the graduates elect to continue their education in graduate and professional schools.

STUDENT ACTIVITIES

Students in the School of Agriculture and Life Sciences have ample opportunities to take part in broadening extracurricular activities. Most departments have student organizations which provide professional as well as social experience. Representatives of these clubs form the Agri-Life Council. This council is the student organization representing the school. Student tours provide an opportunity to see firsthand the application of classroom principles. In addition, students representing agronomy, animal science, horticultural science, food science, poultry science and soil science compete regionally and nationally in a number of activities providing student members a chance to learn by travel as well as by participation.

CURRICULA OFFERINGS AND REQUIREMENTS

A freshman enrolling in agriculture and life sciences has a common core of courses the first year, courses that are appropriate in all curricula. This method allows the student time to study various programs before selecting a curricula. In addition to the basic courses in English, biology, and physical and social sciences, the student selects a major in a department, an interdisciplinary program or an individualized course plan.

Departmental majors are offered in three general curricula as follows:

Science—agricultural economics, animal science, biological and agricultural engineering (joint program with the School of Engineering), botany, crop science, entomology, food science, horticultural science, medical technology, poultry science, rural sociology, soil science, wildlife biology and zoology. Premedical sciences are offered in this curriculum.

Business—emphasis on economics, combination programs in technology in animal science, horticultural science, poultry science and soil science.

Technology—biological and agricultural engineering, animal science, food science, horticultural science and poultry science.

Interdepartmental and Interdisciplinary Programs—These curricula offer the opportunity to select broad curriculum majors that involve two or more departments or schools:

Biological Sciences—A curriculum with emphasis on biological and physical sciences, especially designed for graduate or professional courses requiring a biology background.

Conservation—A curriculum concentrating on the use, preservation and improvement of natural resources. Administered jointly by the School of Agriculture and Life Sciences and the School of Forest Resources.

Pest Management (for Crop Protection)—A curriculum with emphasis on the application of chemical and biological principles in the control of plant diseases, insects and weeds. The curriculum is administered by the Departments of Crop Science, Entomology, Horticultural Science and Plant Pathology.

Agronomy—A technical curriculum dealing with the fundamentals of crop production and soil management. The curriculum is administered by the Departments of Crop Science and Soil Science.

Individualized Study Program—A curriculum planned by the student with the assistance of a faculty advisory committee.

In addition to these cited curricula, a number of arrangements are available that provide the student an opportunity to select areas of course concentration.

HONORS PROGRAM

The School of Agriculture and Life Sciences has a comprehensive Honors Program for qualified freshmen and sophomores interested in participating in seminar discussion programs on broad topics. These sessions are led by outstanding professors.

Qualified juniors and seniors have an opportunity to participate in an independent research program. Faculty direction is provided on an individual basis to each student. The student has the opportunity to select his project.

INTERNATIONAL ASPECTS

An International Seminar is offered to interested students. In addition, an International Option, requiring modern language and 12 semester hours of appropriate courses in the social sciences, is available for students enrolled in any curricula.

DEGREES

The Bachelor of Science degree is conferred upon the satisfactory completion of one of the curricula in this school.

The degrees of Master of Science, Master of Agriculture and Master of Life Sciences are offered in the various departments in the school.

The Doctor of Philosophy degree is offered in the following subject areas: animal science, biochemistry, biological and agricultural engineering, botany, crop science, economics, entomology, food science, genetics, horticultural science, marine sciences, microbiology, nutrition, physiology, plant pathology, sociology, soil science, and zoology.

Further information on graduate offerings may be found in the Graduate School Catalog.

OPPORTUNITIES

Broad and fascinating opportunities in business, industry, education and government are open to graduates of this school. Some of the areas in which graduates are employed are as follows:

Business and Industry—banking and credit, insurance, farm management, cooperatives, land appraisal, marketing, transportation, food chains, food processing

and distribution, machinery and equipment, chemicals, fertilizer, feed manufacturing, seed improvement.

Communications—writing, reporting, radio, television, newspapers, magazines, advertising, publications.

Conservation—soil, water, range, forest, fish, wildlife parks, recreation.

Education—high school and college instruction in agriculture, biology, agricultural extension, governmental and industrial agencies.

Farming and Ranching (agricultural production)—general livestock, field crops, fruits, vegetables, poultry, ornamentals.

Preprofessional and Graduate Preparation—premedical programs for training for medical, dental and veterinary colleges; graduate programs.

Research—production, marketing, engineering, processing, biological sciences, conservation, organizational structure, group behavior.

Services—inspection and regulation, production field service, health services, environmental quality, product standards, grading, agricultural technology and consulting.

A placement office, part of the University Career Planning and Placement Center, is maintained to assist graduates in career development and placement.

FRESHMAN YEAR

The curricula in the School of Agriculture and Life Sciences have a common freshman year with the exception of the science program in biological and agricultural engineering. For the science curricula in biological and agricultural engineering freshman year, see freshman year in the School of Engineering.

Fall Semester	*Credits*
ALS 103 Introductory Topics in ALS	1
BS 100 General Biology or CH 101 General Chemistry I	4
ENG 111 Composition and Rhetoric	3
Social Science and Humanities Elective	3
MA 111 Algebra and Trigonometry*	4
Physical Education	1
(Military Science or Air Science may be elected)	
	16

Spring Semester	*Credits*
ENG 112 Composition and Reading	3
MA 112 Analytic Geometry and Calculus A	4
or	
MA 114 Topics in Modern Mathematics	3
Social Science and Humanities Elective	3
CH 101 General Chemistry I or CH 107 Principles of Chemistry	
or	
Science Elective	4
Physical Education	1
(Military Science or Air Science may be elected)	
	14-15

* Does not contribute to the 130 semester hours required in the biological sciences curriculum.

CURRICULA IN AGRICULTURE AND LIFE SCIENCES*

Science, business and technology are three curricula offered in this school. All departments offer the science curriculum. Several departments offer the choice of either science or technology. In addition, several departments are participating in interdisciplinary programs.

A business curriculum is offered in agricultural economics. Combinations in business and technology are offered in animal science, horticultural science and poultry science. Double majors between agricultural economics and other subject areas may be arranged.

All the curricula have a core of required courses on a school basis. Courses peculiar to a specific department are listed under the departmental requirements. Listed on the following pages are the required courses by curriculum on a school basis.

* Group A includes the physical and biological sciences; Group B, economics and business management; Group C, applied science and technology; Group D, social sciences and humanities.

Science

		Credits
ALS 103	Introductory Topics in ALS	1
	Languages (12 Credits)	
ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
	Electives (English or Modern Language)	6
	Social Sciences and Humanities (21 Credits)	
	Electives from Group D	21
	Physical and Biological Sciences (28-32 Credits)	
BS 100	General Biology	4
	Biological Sciences Elective	4
CH 101	General Chemistry I	4
CH 103	General Chemistry II	4
	or	
CH 107	Principles of Chemistry	4
MA 111	Algebra and Trigonometry	4
MA 112	Analytic Geometry and Calculus A	4
	or	
MA 114	Topics in Modern Mathematics	3
PY 221	College Physics	5
	or	
PY 211, PY 212	General Physics	8
	Electives (60-64 Credits)	
	Restricted Electives from Group A	22-26
	Departmental Requirements and Electives	26
	Free Electives	12
	Subtotal	126
	Physical Education	4
	Total Hours for Graduation	130*

Business

Accounting:		Credits
ACC 260	Accounting I—Concepts of Financial Reporting	3
ACC 261	Accounting II—Financial Information Systems	3
ACC 262	Managerial Uses of Cost Data	3
ACC 360	Financial Reporting Theory & Practice I	3
ACC 361	Financial Reporting Theory & Practice II	3
ACC 362	Production Cost Analysis & Control	3
ACC 460	Specialized Financial Reporting Theory & Practice	3
ACC 464	Income Taxation	3
ACC 466	Examination of Financial Statements	3
ACC 468	Professional Accountancy Resumé	3
Production:		
EC 303	Farm Management	3
EC 325	Industrial Management	3
EC 551	Agricultural Production Economics	3
Marketing:		
EC 311	Agricultural Markets	3
EC 313	Marketing Methods	3
EC 521	Markets and Trade	3
Finance:		
EC 304	Financial Institutions	3
EC 415	Farm Appraisal and Finance	3
EC 420	Corporation Finance	3
Personnel:		
EC 326	Personnel Management	3
EC 332	Industrial Relations	3
EC 431	Labor Economics	3
Business Management:		
EC 310	Economics of the Firm	3
EC 525	Management Policy and Decision Making	3
Electives:		
EC 301	Production and Prices	3
EC 302	Aggregate Economic Analysis: Theory and Policy	3
	Group B Courses	

Students in the business curriculum complete a minimum of 24 semester hours in Group B courses. One course is required in the areas of accounting, production, marketing, finance and personnel. In addition, three courses are elected from Group B course offerings.

Technology

		Credits
ALS 103	Introductory Topics in ALS	1
	Languages (12 Credits)	
ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
SP 231	Expository Speaking	3
	Electives (English or Modern Language)	3
	Social Sciences and Humanities (21 Credits)	
	Electives from Group D	21
	Physical and Biological Sciences (32-33 Credits)	
BS 100	General Biology	4
	Biological Sciences Elective	4

CH 101	General Chemistry I	4
CH 103	General Chemistry II	4
	or	
CH 107	Principles of Chemistry	4
MA 111	Algebra and Trigonometry	4
MA 112	Analytic Geometry and Calculus A	4
	or	
MA 114	Topics in Modern Mathematics	3
PY 221	College Physics	5
SSC 200	Soil Science	4

Electives (59-60 Credits)

Restricted Electives from Groups A, B or C	20-21
Departmental Requirements and Electives	27
Free Electives	12
Subtotal	126
Physical Education	4
Total Hours for Graduation	130**

** All curricula require the completion of one course in literature.

ELECTIVES

The following lists provide typical courses that are elected from the four block groupings—A, B, C and D. Additional courses may be selected by checking with the office of the Director of Academic Affairs.

Group A

PHYSICAL SCIENCES:

Biochemistry:

BCH 351 Elementary Biochemistry
BCH 452 Experimental Biochemistry

Chemistry:

CH 107 Principles of Chemistry
CH 220 Introductory Organic Chemistry
CH 221 Organic Chemistry I
CH 223 Organic Chemistry II
CH 315 Quantitative Analysis
CH 331 Introductory Physical Chemistry

Computer Science:

CSC 102 Programming Concepts
CSC 111 Algorithmic Languages I
CSC 112 Basic Computer Organization and Assembly Language

Geosciences:

GY 120 Physical Geology
GY 208 Environmental Physical Geology
MY 386 Climate Near the Ground

Mathematics:

Must use one or the other of the following two sequences: MA 111, 112, 212 or MA 102, 201, 202

MA 102 Analytic Geometry and Calculus I
MA 111 Algebra and Trigonometry
MA 112 Analytic Geometry and Calculus A
MA 114 Topics in Modern Mathematics
MA 201 Analytic Geometry and Calculus II
MA 202 Analytic Geometry and Calculus III
MA 212 Analytic Geometry and Calculus B
MA 301 Applied Differential Equations I

Meteorology:

MY 411 Introductory Meteorology

Physics:

PY 223 Astronomy
PY 407 Introduction to Modern Physics

Soil Science:

SSC 200 Soil Science
SSC 511 Soil Physics
SSC 520 Soil and Plant Analysis
SSC 522 Soil Chemistry

Statistics:

ST 311 Introduction to Statistics
ST 361 Introduction to Statistics for Engineers

BIOLOGICAL SCIENCES:

Animal Science:

ANS (FS, NTR) 301 Nutrition and Man
ANS 401 Reproductive Physiology
ANS 405 Lactation
ANS (NTR, PO) 415 Comparative Nutrition
ANS (PHY) 502 Reproductive Physiology of Vertebrates

Biological and Agricultural Engineering:

BAE 303 Energy Conversion in Biological Systems

Botany:

BO 200 Plant Life
BO (ZO) 360 Introduction to Ecology
BO 400 Plant Diversity
BO (CS) 402 Economic Botany
BO 403 Systematic Botany
BO (ZO) 414 Cell Biology
BO 421 Plant Physiology
BO 480 Air Pollution Biology

Entomology:

ENT 201 Insects and Man

ENT 301 Introduction to Forest Insects
ENT 312 Introduction to Economic Insects
ENT 502 Insect Diversity
ENT 503 Functional Systems of Insects
ENT 550 Fundamentals of Insect Control
ENT 562 Agricultural Entomology
ENT (ZO) 582 Medical and Veterinary Entomology

Food Science:

FS (ANS, NTR) 301 Nutrition and Man
FS 402 Food Chemistry
FS (MB) 405 Food Microbiology
FS (MB) 506 Advanced Food Microbiology

Genetics:

GN 504 Human Genetics
GN (ZO) 532 Biological Effects of Radiations
GN (ZO) 540 Evolution

Microbiology:

MB 401 General Microbiology
MB (FS) 405 Food Microbiology
MB (FS) 506 Advanced Food Microbiology
MB 514 Microbial Metabolism
MB 571 Virology

Nutrition:

NTR (ANS, FS) 301 Nutrition and Man
NTR (ANS, PO) 415 Comparative Nutrition

Plant Pathology:

PP 315 Plant Diseases
PP (FOR) 318 Forest Pathology
PP 500 Plant Disease Control

Poultry Science:

PO (VET) 401 Poultry Diseases
PO 405 Avian Physiology
PO (ANS, NTR) 415 Comparative Nutrition
PO (ZO) 524 Comparative Endocrinology

Veterinary Science:

VET (PO) 401 Poultry Diseases

Zoology:

ZO 201 Animal Life
ZO 202 Invertebrate Zoology
ZO 203 Vertebrate Zoology
ZO 315 General Parasitology
ZO 323 Comparative Anatomy
ZO 345 Histology
ZO (BO) 360 Introduction to Ecology
ZO 361 Vertebrate Embryology
ZO (BO) 414 Cell Biology
ZO 420 Fishery Science
ZO 421 Vertebrate Physiology
ZO 441 Ichthyology
ZO (PO) 524 Comparative Endocrinology
ZO (GN) 532 Biological Effects of Radiations
ZO (GN) 540 Evolution
ZO (ENT) 582 Medical and Veterinary Entomology

Group B

ECONOMICS AND BUSINESS MANAGEMENT:

Economics:

ACC 260 Accounting I—Concepts of Financial Reporting
ACC 261 Accounting II—Financial Information Systems
ACC 262 Managerial Uses of Cost Data
ACC 360 Financial Reporting Theory & Practice I
ACC 361 Financial Reporting Theory & Practice II
ACC 362 Production Cost Analysis & Control
ACC 460 Specialized Financial Reporting and Practice
ACC 464 Income Taxation
ACC 466 Examination of Financial Statements
ACC 468 Professional Accountancy Résumé
EC 301 Production and Prices
EC 302 Aggregate Economic Analysis: Theory and Policy
EC 303 Farm Management
EC 304 Financial Institutions
EC 307 Business Law I
EC 308 Business Law II
EC 310 Economics of the Firm
EC 311 Agricultural Markets
EC 313 Marketing Methods
EC 317 Introduction to Methods of Economic Analysis
EC 325 Industrial Management
EC 326 Personnel Management
EC 332 Industrial Relations
EC 415 Farm Appraisal and Finance
EC 420 Corporation Finance
EC 430 Agricultural Price Analysis
EC 431 Labor Economics
EC 440 Economic Development

Mathematics:

MA 122 Mathematics of Finance and Elementary Statistics

Group C

APPLIED SCIENCE AND TECHNOLOGY:

Agricultural Communications:

AC 311 Communications Methods and Media

Animal Science:

ANS 200 Introduction to Animal Science
ANS 204 Livestock Feeds and Feeding

ANS 302 Selecting Dairy and Meat Animals
ANS 308 Advanced Selection Dairy and Meat Animals
ANS 402 Beef Cattle Management
ANS 403 Swine Management
ANS 404 Dairy Cattle Management
ANS 406 Sheep Management
ANS (FS) 409 Meat and Meat Products
ANS 410 Horse Management
ANS 411 Breeding and Improvement of Domestic Animals
ANS (VET) 505 Diseases of Farm Animals
ANS (GN) 508 Genetics of Animal Improvement

Biological and Agricultural Engineering:

BAE 211 Farm Machinery
BAE (SCC) 321 Irrigation, Terracing and Erosion Control
BAE (FS) 331 Food Engineering
BAE 322 Farm Structures
BAE 341 Farm Electrifications and Utilities
BAE 411 Farm Power and Machinery
BAE 433 Crop Preservations and Processing

Crop Science:

CS 211 Crop Science
CS 311 Field Crop Production
CS 312 Pastures and Forage Crops
CS 315 Turf Management
CS 413 Plant Breeding
CS 414 Weed Science
CS (SSC) 462 Soil-Crop Management Systems
CS 511 Tobacco Technology
CS 513 Physiological Aspects of Crop Production
CS (HS) 514 Principles and Methods in Weed Science

Food Science:

FS (BAE) 331 Food Engineering
FS (PO) 404 Poultry Products
FS (ANS) 409 Meat and Meat Products

Genetics:

GN (ANS) 508 Genetics of Animal Improvement
GN (PO) 520 Poultry Breeding

Horticultural Science:

HS 201 Principles of Horticulture
HS 301 Plant Propagation
HS 342 Landscape Horticulture
HS 421 Fruit Production
HS 432 Vegetable Production
HS 441, 442 Floriculture I and II

Poultry Science:

PO 201 Poultry Science and Production
PO 301 Evaluation of Live Poultry
PO 351 Grading and Evaluation of Poultry Products
PO 402 Commercial Poultry Enterprises
PO (FS) 404 Poultry Products
PO (GN) 520 Poultry Breeding

Soil Science:

SSC 205 Soils as a Natural Resource
SSC (BAE) 321 Irrigation, Terracing and Erosion Control
SSC 341 Soil Fertility and Fertilizers
SSC 352 Soil Classification
SSC 461 Soil and Water Conservation
SSC (CS) 462 Soil-Crop Management Systems
SSC 472 Forest Soils

Veterinary Science:

VET (ANS) 505 Diseases of Farm Animals

Zoology:

ZO 212 Basic Anatomy and Physiology
ZO 221 Conservation of Natural Resources

Group D

SOCIAL SCIENCES AND HUMANITIES:

The student is required to complete 21 semester hours of Group D courses in all degree programs. Not more than six semester hours are to come from one department. It is strongly recommended that the student be exposed to courses in each of the major course areas outlined below, although the final selection is with the student and his adviser.

AREA–I

Anthropology:

All courses

Economics:

EC 201 Economics I
EC 202 Economics II
EC 212 Economics of Agriculture
EC (HI) 370 The Rise of Industrialism
EC (HI) 371 Evolution of the American Economy
EC 401 Economic Analysis for Nonmajors
EC 410 Public Finance
EC 413 Competition, Monopoly and Public Policy
EC 422 Investments and Portfolio Management
EC 435 Urban Economics
EC 436 Environmental Economics
EC 442 Evolution of Economic Ideas
EC 448 International Economics
EC 475 Comparative Economic Systems

Psychology, Sociology:

All courses

AREA–II

History, Politics, Social Studies, University Studies:

All courses

AREA–III

Art:

Courses that relate to the appreciation and history of art

English:

Literature courses only

Modern Language, Music:

Courses numbered 200 and above

Philosophy, Religion:

All courses

Adult and Community College Education

(See Education.)

The adult and community college education faculty offers instruction primarily at the graduate level. The department is jointly administered by the Schools of Agriculture and Life Sciences and Education. For details, see Education, pages 95-96.

Agronomy

Students may earn a Bachelor of Science degree under the technology curriculum of Agriculture and Life Sciences with a major in agronomy. The agronomy option is administered jointly by the Departments of Crop Science and Soil Science. For further information, see crop science, page 64, or soil science, page 81.

TYPICAL CURRICULUM IN AGRONOMY

TECHNOLOGY PROGRAM

For the freshman year, see page 47.

SOPHOMORE YEAR

	Credits
CH 103 General Chemistry II	4
CS 211 Crop Science	4
CS 214 Crop Science Laboratory	1
SP 231 Expository Speaking	3
Free Electives	6
SSC 200 Soil Science	4
Group A, B, or C Elective	3
Group D Electives	6
Physical Education	2
	33

JUNIOR YEAR

	Credits
BO 421 Plant Physiology	4
CH 220 Introductory Organic Chemistry	4
CS 312 Pastures and Forage Crops	3
PP 315 Plant Diseases	3
PY 221 College Physics	5
SSC 341 Soil Fertility and Fertilizers	3
SSC 342 Soil Fertility Laboratory	1
SSC 352 Soil Classification	4
Literature Elective	3
Group D Electives	3
	33

SENIOR YEAR

	Credits
CS 411 Environmental Aspects of Crop Production	2
CS 413 Plant Breeding	2
CS 414 Weed Science	3
GN 411 The Principles of Genetics	3
SSC (CS) 462 Soil-Crop Management Systems	3
SSC 492 Senior Seminar in Soil Science	1
or	
CS 490 Senior Seminar in Crop Science	
Group A, B, or C Electives	7-8
Free Electives	6
Group D Electives	6
	33-34

Total Hours for Graduation 130

Animal Science

Polk Hall

Professor I. D. Porterfield, *Head of the Department*

TEACHING AND RESEARCH

Professors: E. R. Barrick, A. J. Clawson, E. J. Eisen, L. Goode, J. M. Leatherwood, J. G. Lecce, J. E. Legates, B. T. McDaniel, R. D. Mochrie, A. H. Rakes, H. A. Ramsey, O. W. Robison, H. A. Schneider, L. C. Ulberg; *Adjunct Professor*: J. A. Santolucito; *Professors Emeriti*: C. D. Grinnells, F. H. Smith, H. A. Stewart, G. H. Wise; *Associate Professors*: E. V. Caruolo, D. G. Davenport, E. U. Dillard, R. W. Harvey, W. L. Johnson, E. E. Jones, J. J. McNeill, R. M. Myers, J. C. Wilk; *Assistant Professor*: B. H. Johnson; *Adjunct Assistant Professors*: B. D. Harrington, R. B. Leidy; *Assistant Professor Emeritus:* J. L. Moore; *Associate Members of the Faculty*: G. Matrone, S. B. Tove (Biochemistry); C. H. Hill (Poultry Science); E. G. Batte, D. J. Moncol (Veterinary Science)

EXTENSION

Professor A. V. Allen, *In Charge, Animal Husbandry Extension*
Professor M. E. Senger, *In Charge, Dairy Husbandry Extension*
Associate Professor D. G. Spruill, *In Charge, Swine Husbandry Extension*
Professors: R. F. Behlow, T. C. Blalock, J. S. Buchanan, G. Hyatt Jr., G. S. Parsons, J. W. Patterson, J. R. Woodard; *Associate Professors*: J. R. Jones, F. N. Knott, F. D. Sargent, C. M. Stanislaw, D. P. Wesen; *Assistant Professors*: K. R. Butcher, G. B. Creed, T. M. Leonard; *Assistant Professor Emeritus:* R. R. Rich; *Extension Specialists:* E. B. Shankle II, H. W. Webster III, G. R. Griffin; *Extension Specialist Emeritus:* J. A. Arey

Undergraduate students study subjects related to various phases of animal industry. Training is provided in nutrition, physiology, breeding and disease and there are opportunities for the application of basic scientific training in the husbandry areas. Options for course selection by each student make it possible for those with varying backgrounds and wide-ranging interests to become involved in stimulating and rewarding training.

OPPORTUNITIES

Opportunities for animal science majors include farm, dairy and livestock management careers, jobs as fieldmen for breed association and livestock organizations, agricultural extension, education work in business and industries serving agriculture, meat grading, agricultural communications in animal science, feed manufacturing, sales work in feeds and equipment, marketing dairy cattle and dairy products, and supervising livestock and farm loans with banks and lending agencies. Many students in veterinary science obtain degrees in animal science as well. Students may elect graduate study, after which they will find opportunities in teaching, research and development. See pages 12-14 for graduate degrees offered.

UNDERGRADUATE CURRICULUM

The degree of Bachelor of Science with a major in animal science may be obtained under any of the three curricula offered in Agriculture and Life Sciences. For the basic requirements and freshman year see page 47.

CURRICULA IN ANIMAL SCIENCE

BUSINESS PROGRAM

This curriculum provides a background in business with a technical knowledge of animal science. The program requires the completion of courses in the technology curriculum, page 48, and the economic and business courses as outlined on page 50.

SCIENCE PROGRAM

See typical curriculum on pages 54-55. Departmental requirements are indicated by asterisks. In addition, the student needs a minimum of nine credits from:

ANS 401 Reproductive Physiology 3
ANS 405 Lactation 3
ANS 411 Breeding and Improvement of Domestic Animals 3
ANS (NTR, PO) 415 Comparative Nutrition 3
ANS (VET) 505 Diseases of Farm Animals 3

TECHNOLOGY PROGRAM

See typical curriculum on page 55. Departmental requirements are indicated by asterisks. In addition, the student needs a minimum of nine credits from:

ANS 401 Reproductive Physiology 3
ANS 405 Lactation 3
ANS 411 Breeding and Improvement of Domestic Animals 3
ANS (NTR, PO) 415 Comparative Nutrition 3
ANS (VET) 505 Diseases of Farm Animals 3

Also, a minimum of five credits from the following courses:

ANS 302 Selecting Dairy and Meat Animals 2
ANS 402 Beef Cattle Management 3
ANS 403 Swine Management 3
ANS 404 Dairy Cattle Management 3
ANS 406 Sheep Management 3
ANS 410 Horse Management 3

TYPICAL CURRICULUM IN ANIMAL SCIENCE

SCIENCE PROGRAM

For the freshman year see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*ANS 200 Introduction to Animal Science	4	ANS 204 Livestock Feeds and Feeding	3
CH 103 General Chemistry II	4	CH 220 Introductory Organic Chemistry	4
or		or	
CH 107 Principles of Chemistry	4	CH 221 Organic Chemistry I	4
SP 231 Expository Speaking	3	PY 221 College Physics	5
Group A Elective	3	Social Science and Humanities Elective	3
Free Elective	3	Physical Education	1
Physical Education	1		16
	18		

The student's choice of CH 220 or CH 221 is dependent upon his previous completion of either CH 103, General Chemistry II, or CH 107, Principles of Chemistry.

JUNIOR YEAR

Fall Semester	*Credits*		
CH 223 Organic Chemistry II	4	ENG 205 Studies of Great Works of Literature	3
or		Social Science and Humanities Elective	3
Group A Elective	4		16
*GN 411 The Principles of Genetics	3		
ANS (NTR, PO) 415 Comparative Nutrition	3		

Spring Semester	*Credits*
ANS 409 Meats and Meat Products	3
BCH 351 Elementary Biochemistry	3
*ZO 421 Vertebrate Physiology	3
ANS 402 Beef Cattle Management	3
Free Elective	3
	15

SENIOR YEAR

Fall Semester	*Credits*
ANS 411 Breeding and Improvement of Domestic Animals	3
ANS (VET) 505 Diseases of Farm Animals	3
Animal Science Elective	3
Social Science and Humanities Elective	3
Free Electives	6
	18

Spring Semester	*Credits*
ANS 401 Reproductive Physiology	3
ANS 403 Swine Management	3
*ANS 490 Animal Science Seminar	1
*MB 401 General Microbiology	4
Social Science and Humanities Elective	6
	17
Total Hours for Graduation	130

* Departmental requirements.

TYPICAL CURRICULUM IN ANIMAL SCIENCE

TECHNOLOGY PROGRAM

For the freshman year, see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*
*ANS 200 Introduction to Animal Science	4
CH 103 General Chemistry II	4
SP 231 Expository Speaking	3
Social Science and Humanities Elective	3
Physical Education	1
	15

Spring Semester	*Credits*
*ANS 204 Livestock Feeds and Feeding	3
PY 221 College Physics	5
CH 220 Introductory Organic Chemistry	4
Social Science and Humanities Elective	3
Physical Education	1
	16

JUNIOR YEAR

Fall Semester	*Credits*
ANS (VET) 505 Diseases of Farm Animals	3
ENG 205 Studies in Great Works of Literature	3
*ZO 421 Vertebrate Physiology	3
*GN 411 The Principles of Genetics	3
Free Elective	4
	16

Spring Semester	*Credits*
ANS 302 Selecting Dairy and Meat Animals	2
ANS 402 Beef Cattle Management	3
CS 312 Pasture and Forage Crops	3
SSC 200 Soil Science	4
Social Science and Humanities Elective	3
Free Elective	3
	18

SENIOR YEAR

Fall Semester	*Credits*
ANS 308 Advanced Selection Dairy and Meat Animals	1
ANS 410 Horse Management	3
ANS 411 Breeding and Improvement of Domestic Animals	3
Social Science and Humanities Electives	6
Free Electives	5-6
	18-19

Spring Semester	*Credits*
ANS 401 Reproductive Physiology	3
ANS 403 Swine Management	3
ANS (FS) 409 Meat and Meat Products	3
*ANS 490 Animal Science Seminar	1
Group A, B or C Elective	3
Free Elective	3
	16
Total Hours for Graduation	130

* Departmental Electives.

Biochemistry

Polk Hall

Professor G. Matrone, *Head of the Department*
Professors: F. B. Armstrong, H. R. Horton, J. S. Kahn, I. S. Longmuir, A. R. Main, S. B. Tove; *Associate Professors*: J. A. Knopp, E. C. Sisler; *Assistant Professor*: E. C. Theil; *Associate Members of the Faculty:* E. E. Jones (Animal Science), J. Bordner, L. W. Aurand (Food Science), W. P. Tucker (Chemistry)

The Department of Biochemistry offers instruction at the undergraduate and graduate levels. Undergraduate courses provide students from a number of curricula with a fundamental background in biochemistry.

The graduate program trains scientists for research and teaching careers in biochemistry and related fields. For graduate degrees offered, see pages 12-14.

Biochemistry is jointly administered by the Schools of Agriculture and Life Sciences and Physical and Mathematical Sciences.

UNDERGRADUATE CURRICULUM

The undergraduate curriculum leads to the B.S. degree in the biological sciences with an option in biochemistry. See below and page 49.

BIOLOGICAL SCIENCES CURRICULUM

BIOCHEMISTRY EMPHASIS

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry	4	CH 107 Principles of Chemistry	4
MA 102 Analytic Geometry & Calculus I		MA 201 Analytic Geometry & Calculus II	
or		or	
MA 112 Analytic Geometry & Calculus A	4	MA 212 Analytic Geometry & Calculus B	3-4
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
ALS 103 Introductory Topics in ALS	1	BS 100 General Biology	4
Group D Elective	3	Physical Education	1
Physical Education	1		15-16
	6		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
MA 202 Analytic Geometry & Calculus III		BO 200 Plant Life	4
or		Modern Foreign Language	3
MA 114 Topics in Modern Math	3-4	Group D Elective	3
Modern Foreign Language	3	Physical Education	1
ZO 201 Animal Life	4		15
Physical Education	1		
	15-16		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 301 Applied Differential Equations I	3	BCH 351 Elementary Biochemistry	3
CH 428 Qualitative Organic Analysis		CH 431 Physical Chemistry I	
or		or	
CH 315 Quantitative Analysis	3-4	CH 331 Introductory Physical Chemistry	3-4
PY 211 General Physics		PY 212 General Physics	
or		or	
PY 205 General Physics	4	PY 208 General Physics	4
BO (ZO) 360 Introduction to Ecology	4	GN 411 The Principles of Genetics	3
Group D Elective	3	GN 412 Elementary Genetics Laboratory	1
	17-18	Group D Elective	3
			17-18

SENIOR YEAR

Fall Semester	*Credits*
BCH 452 Experimental Biochemistry	3
CH 433 Physical Chemistry II	
or	
Free Elective	3
BO 421 Plant Physiology	
or	
ZO 421 Vertebrate Physiology	
or	
ZO (BO) 414 Cell Biology	3-4
Group D Elective	3
Free Elective	3-4
	15-17

Spring Semester	*Credits*
MB 401 General Microbiology	4
ST 311 Introduction to Statistics	
or	
CSC 111 Algorithmic Languages I	
or	
Mathematics Elective	2-3
Group D. Electives	6
Free Electives	6
	18-19
Total Hours for Graduation	130

Biological and Agricultural Engineering

(Also see Engineering.)

David S. Weaver Laboratories

Professor F. J. Hassler, *Head of the Department*

TEACHING AND RESEARCH

Professors: H. D. Bowen, J. W. Dickens (USDA), J. N. Fore, D. H. Howells, B. K. Huang, E. G. Humphries, W. H. Johnson, G. J. Kriz, C. W. Suggs, E. H. Wiser; *Professors Emeriti:* G. W. Giles, J. W. Weaver, Jr.; *Associate Professors:* G. B. Blum, Jr., E. L. Howell, W. F. McClure, R. P. Rohrbach, R. W. Skaggs, R. S. Sowell, T. B. Whitaker (USDA), J. H. Young; *Assistant Professors:* C. F. Abrams, Jr., G. R. Baughman, M. R. Overcash, D. H. Willits, Jr.; *Associate Members of the Faculty:* D. D. Hamann, V. A. Jones (Food Science)

EXTENSION

Associate Professor: F. J. Humenik, *Associate Head in Charge of Extension*

Professor Emeritus: H. M. Ellis; *Associate Professors:* E. O. Beasley, L. B. Driggers, J. W. Glover, W. C. Warrick, R. W. Watkins; *Associate Professor Emeritus:* J. C. Ferguson; *Assistant Professors:* J. C. Barker, R. E. Sneed

Biological and agricultural engineering students train to deal with problems of agriculture that are engineering in nature. Scientific and engineering principles are applied to the conservation and utilization of water and soil, the development of power and labor-saving devices for all phases of agricultural production, the design of structures and equipment for housing and handling livestock and field products, and the processing and marketing of farm products.

Two curricula are offered, technology and science, which are explained below. Science graduates receive a B.S. in biological and agricultural engineering. Technology students receive the B.S. in agriculture.

OPPORTUNITIES

Persons in the science curriculum are qualified for positions in design, development and research in public institutions and in industry, and for teaching and extension work in institutions of higher education. This curriculum, accredited by the Engineering Council for Professional Development, also provides adequate training for post-graduate work leading to advanced degrees. For information on graduate study, see pages 12-14.

Those trained in agricultural engineering technology are qualified for positions in sales and service of agricultural equipment such as farm machinery, irrigation

systems, etc.; as county agents or farmers; and for farm advisory work with such organizations as electric power companies.

CURRICULUM IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

SCIENCE PROGRAM

The science curriculum develops young people capable of engineering leadership in agriculture. Emphasis is placed on basic science courses such as mathematics, physics, mechanics, biology, soils, and thermodynamics, which provide a sound background for engineering and agricultural technology. Courses are directed to those methods of thought and techniques whereby science can be applied with understanding and judgment to engineering situations related to agricultural operations.

Since biological and agricultural engineering involves two distinct technical fields—agriculture and engineering—the science curriculum is a joint responsibility of Agriculture and Life Sciences and Engineering and is so administered. Undergraduate students in this curriculum may officially enroll in either school; duplicate undergraduate records are maintained in both schools.

For the program in agricultural engineering science, refer to the freshman year in the School of Engineering and the typical curriculum in Engineering, pages 116-117.

CURRICULUM IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

TECHNOLOGY PROGRAM

The technology curriculum is for those who wish to work at the applied level in the agribusiness complex. Graduates are equipped to apply to the farm the new technology as developed and revealed by the professional agricultural engineer. The courses are presented and directed toward the solution of consumer problems with emphasis on the techniques employed.

Listed below are the departmental requirements in the technology program and a typical curriculum.

TYPICAL CURRICULUM IN AGRICULTURAL ENGINEERING TECHNOLOGY

For the freshman year see page 47. (Students enrolled in agricultural engineering technology are required to take MA 112 instead of MA 114.)

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*BAE 211 Farm Machinery	4	*BAE 341 Farm Electrification & Utilities	3
CH 103 General Chemistry II	4	Biological Science Elective	4
PY 211 General Physics**	4	PY 212 General Physics	4
SP 231 Expository Speaking	3	SSC 200 Soil Science	4
Physical Education	1	Physical Education	1
	16		16

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*BAE (FS) 331 Food Engineering	3	*BAE 303 Energy Conversion in Biological Systems	2
*E 101 Engineering Graphics I	2	*BAE 321 Irrigation, Terracing & Erosion Control	3
Social Science & Humanities Electives	6	Free Elective	3
English Elective (literature)	3	Social Science & Humanities Elective	6
Free Elective	3	Group A, B, or C Elective	3
	17		17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*BAE 433 Crop Preservation & Processing	3	*BAE 332 Farm Structures	3
Free Elective	3	*BAE 411 Farm Power & Machinery	3
Group A, B, or C Electives	9	Free Electives	3
Social Science & Humanities Elective	3	Group A, B, or C Electives	6
	18		15
		Total Hours for Graduation	130

* Departmental requirements totaling 26 credits.
** PY 211, 212 will be taken in place of PY 221 as shown in the agricultural technology curriculum. These three additional credits are Group A electives required by the department.

Biological Sciences

Gardner Hall

Professor J. L. Apple, *Assistant Director of Academic Affairs and Research for the Biological Sciences*

Professor C. F. Lytle, *Teaching Coordinator and Major Adviser*

The biological sciences curriculum is an interdepartmental program leading to a B.S. degree and designed for students desiring a comprehensive rather than a narrowly specialized education in the biological sciences. It is especially suitable for students preparing for graduate study in a specialized field of biology, for students planning to teach high school biology, and for students preparing for careers in business or industry.

Experience indicates one of the best preparations for graduate study in biology is a broad training in the basic biological sciences supplemented with a strong background in the physical and mathematical sciences. The biological sciences curriculum incorporates these features and provides the student with maximum flexibility and options for graduate specialization.

Students may concentrate on a specific field in the biological sciences curriculum by selecting appropriate free and restricted elective courses in consultation with their advisers. Such programs within the biological sciences curriculum are available to provide options in biochemistry, microbiology, nutrition. Courses may be selected from the School of Education to provide a concentration in biology and teaching.

TYPICAL PROGRAMS IN THE BIOLOGICAL SCIENCES CURRICULUM

GENERAL

For freshman year see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 212 Analytic Geometry & Calculus B	3	ZO 201 Animal Life	4
BO 200 Plant Life	4	CH 223 Organic Chemistry II	4
CH 221 Organic Chemistry I	4	Social Sciences & Humanities (Group D) Elective	3
Social Sciences & Humanities (Group D) Electives	6	Free Elective	3
Physical Education	1	Physical Education	1
	15		15

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PY 211 General Physics	4	PY 212 General Physics	4
BO (ZO) 360 Introduction to Ecology	3	BCH 351 Elementary Biochemistry	3

Modern (foreign) Language	3
Group D Elective	3
Free Elective	3
	16

GN 411 The Principles of Genetics	3
GN 412 Elementary Genetics Lab	1
Modern (foreign) Language	3
Group D Elective	3
	17

SENIOR YEAR

Fall Semester	*Credits*
BO 421 Plant Physiology or *ZO 421 Vertebrate Physiology or *BO (ZO) 414 Cell Biology	3-4
Group D Elective	3
Restricted Electives	10
	16-17

Spring Semester	*Credits*
MB 401 General Microbiology	4
Free Electives	9
Restricted Elective	3
	16
Total Hours for Graduation	130

* Students electing ZO 421 or BO (ZO) 414 must also take ZO 415 or BCH 452.

BIOCHEMISTRY EMPHASIS

For a typical curriculum in the biological sciences, biochemistry emphasis, see pages 56-57.

MICROBIOLOGY EMPHASIS

For freshman year see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*
BO 200 Plant Life	4
CH 221 Organic Chemistry I	4
MA 112 or 102 Analytic Geometry and Calculus I or B	4
Elective	3
Physical Education	1
	16

Spring Semester	*Credits*
ZO 201 Animal Life	4
CH 223 Organic Chemistry II	4
MA 212 or 201 Analytic Geometry and Calculus B or II	3-4
Elective	3
Physical Education	1
	15-16

JUNIOR YEAR

Fall Semester	*Credits*
BO (ZO) 360 Introduction to Ecology	4
*BO (ZO) 414 Cell Biology	3
PY 211 General Physics	4
BCH 351 Elementary Biochemistry	3
Elective	3
	17

Spring Semester	*Credits*
GN 411, 412 The Principles of Genetics, Elementary Genetics Laboratory	4
MB 401 General Microbiology	4
PY 212 General Physics	4
BCH 452 Experimental Biochemistry	3
Elective	3
	18

* Students electing ZO 421 or BO (ZO) 414 must elect either ZO 415 or BCH 452.

SENIOR YEAR

Fall Semester	*Credits*
MB 501 Advanced Microbiology	3
Electives	14
	17

Spring Semester	*Credits*
MB 514 Microbiology Metabolism or MB 571 Virology	3
MB 551 Immunology and Serology or MB 521 Microbial Ecology	1-2
Electives	10-11
	14-16
Total Hours for Graduation	130

NUTRITION EMPHASIS

For freshman year see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Modern (foreign) Language	3	Modern (foreign) Language	3
BO 200 Plant Life	4	ZO 201 Animal Life	4
CH 221 Organic Chemistry i	4	CH 223 Organic Chemistry II	4
MA 212 Analytic Geomerty & Calculus B or		BCH 351 Elementary Biochemistry	3
MA 201 Analytic Geometry & Calculus II	3-4	Physical Education	1
Physical Education	1		15
	15-16		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PY 211 General Physics	4	PY 212 General Physics	4
*BO (ZO) 414 Cell Biology	3	GN 411 The Principles of Genetics	3
NTR (ANS, PO) 415 Comparative Nutrition	3	GN 412 Elementary Genetics Laboratory	1
Group D Electives	6	MB 401 General Microbiology	4
	16	Group D Electives	6
			18

* Students electing ZO 421 or BO (ZO) 414 must also elect either ZO 415 or BCH 452.

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BCH 452 Experimental Biochemistry	3	Restrictive Elective	4
NTR (ANS) 416 Quantitative Nutrition	3-4	Group D Electives	3
NTR 490 Nutrition Seminar	1	Free Electives	9
Group D Electives	3	NTR 490 Nutrition Seminar	1
Free Electives	3		17
Restrictive Electives (BO (ZO) 360 recommended)	4	Total Hours for Graduation	130
	17-18		

Botany

Gardner Hall

Professor G. R. Noggle, *Head of the Department*

Professors: A. W. Cooper (on leave), R. J. Downs, J. W. Hardin, W. W. Heck (USDA), H. Seltmann (USDA), J. R. Troyer; *Professors Emeriti:* D. B. Anderson, H. T. Scofield, B. W. Wells, L. A. Whitford; *Adjunct Professor:* A. Krochmal; *Associate Professors:* C. E. Anderson, U. Blum, R. C. Fites, R. L. Mott, H. E. Pattee (USDA), E. D. Seneca; *Adjunct Associate Professor:* D. W. DeJong; *Assistant Professors:* J. F. Reynolds, J. M. Stucky, C. G. Van Dyke, A. M. Witherspoon, T. E. Wynn; *Adjunct Assistant Professor:* G. M. Jividen; *Instructor:* L. M. Stroud; *Associate Members of the Faculty:* J. S. Kahn (Biochemistry), D. H. Timothy (Crop Science), D. E. Moreland (USDA Crop Science), B. W. Smith (Genetics), M. M. Goodman (Statistics), R. J. Thomas (Wood and Paper Science), B. J. Copeland (Zoology)

This instructional program provides classroom, laboratory, and field experience in the major areas of plant science. Undergraduates majoring in botany are given a broad background in the humanities and physical sciences and are encouraged to

participate in independent study the senior year. Majors are prepared for advanced study in botany and other biological fields, as well as in the applied plant sciences such as horticulture, crop science, resource management and environmental biology.

OPPORTUNITIES

Many majors continue with graduate studies; see pages 12-14. There is need for such persons for teaching positions in community and junior colleges, colleges and universities, for research positions in federal and state government laboratories and in private industry.

Recent federal and state legislation has created a need for botanists in environmental quality studies. Persons with a Bachelor of Science degree may work in air and water quality control programs, in air pollution and in environmental impact studies. Field botanists and naturalists are needed in park systems and nature programs.

UNDERGRADUATE CURRICULUM

The Bachelor of Science degree with a major in botany is offered under the science curriculum of the School of Agriculture and Life Sciences. The freshman year program is shown on page 47. Other basic requirements are on pages 47-52.

The Bachelor of Science degree with double concentration—one in economics, English, history, philosophy, politics and another in botany—is available in the School of Liberal Arts. See pages 152-153 for details.

TYPICAL CURRICULUM IN BOTANY

SCIENCE PROGRAM

SOPHOMORE YEAR

	Credits		
BO 403 Systematic Botany	4	SSC 200 Soil Science	4
CH 101 General Chemistry I	4	ZO 201 Animal Life	4
CH 103 General Chemistry II	4	Physical Education	2
Language Electives	6		—
Social Science and Humanities Elective	3		31

JUNIOR YEAR

	Credits		
BO 421 Plant Physiology	4	PY 221 College Physics	5
CH 220 Introductory Organic Chemistry	4	Science Elective	4
GN 411 The Principles of Genetics	3	Electives	8
GN 412 Elementary Genetics Laboratory	1		—
Social Science and Humanities Electives	6		35

SENIOR YEAR

	Credits		
BO (ZO) 360 Introduction to Ecology	4	Electives	16
BO 400 Plant Diversity	4		—
MB 401 General Microbiology	4		34
Social Science and Humanities Electives	6	Total Hours for Graduation	130

Conservation

(Also see Forest Resources.)

Williams, Gardner and Biltmore Halls

M. G. Cook, *Major Adviser, School of Agriculture and Life Sciences*

L. C. Saylor, *Major Adviser, School of Forest Resources*

Conservation is the wise use, perpetuation, or improvement of natural resources, without waste, for the long-time benefit of society. This baccalaureate degree program is offered jointly by the Schools of Agriculture and Life Sciences and Forest Resources. Faculty members in botany, entomology, forestry, plant pathology, recreation, soil science and wildlife are directly involved in various aspects of education in conservation.

Rapid urbanization and industrialization concomitant with population growth and changes in lifestyles are bringing increased pressures on the use of land for providing food, water, fiber, wood and pleasure. These trends present challenges to resource managers who must be well trained in the basic concepts of several disciplines in order to apply a conservation philosophy to many of our current natural resource problems.

CURRICULUM

Students may enroll in either Agriculture and Life Sciences or Forest Resources, depending on their primary area of interest in conservation. The freshman common core of courses for either school is acceptable. All students take a prescribed core of subjects in conservation; specialty areas are developed through the use of electives. Students desiring an education with more professional emphasis may combine the conservation curriculum with another curriculum, e.g., forestry, soil science, zoology, to obtain a second degree.

TYPICAL CURRICULUM IN CONSERVATION

SCIENCE PROGRAM

For the freshman year, see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 103 General Chemistry II	4	ZO 221 Conservation of Natural Resources	3
GY 120 Physical Geology	2	SSC 200 Soil Science	4
GY 110 Physical Geology Lab	1	English Elective	3
BO 200 Plant Life	4	Social Sciences—Humanities Electives	6
English Elective	3	Physical Education	1
Physical Education	1		
	15		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ZO (BO) 360 Introduction to Ecology	4	ST 311 Introduction to Statistics	3
RRA 241 Recreation Resource Relationships	3	PY 221 College Physics	5
Social Sciences—Humanities Electives	6	Social Sciences—Humanities Elective	3
Conservation Elective	3	Conservation Elective	3
		Biological Sciences Elective	3
	16		17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ZO 353 Wildlife Management	3	FOR 472 Renewable Resource Management	3
Conservation Elective	3	Conservation Elective	3
Biological Sciences Elective	3	Biological Sciences Elective	3
Free Electives	8	Free Electives	6
	17		15

Total Hours for Graduation 128

Elective courses may be used for emphasizing subject areas in communications, soils, wildlife biology, education and others.

Crop Science

Williams Hall

Professor P. A. Miller, *Acting Head of the Department*

TEACHING AND RESEARCH

Professors: C. A. Brim (USDA), D. S. Chamblee, J. F. Chaplin (USDA), W. K. Collins, W. A. Cope (USDA), D. A. Emery, D. U. Gerstel, W. C. Gregory, H. D. Gross, P. H. Harvey (on leave), G. L. Jones, K. R. Keller, J. A. Lee (USDA), W. M. Lewis, T. J. Mann, R. P. Moore, D. E. Moreland (USDA), L. L. Phillips, J. C. Rice, D. L. Thompson (USDA), D. H. Timothy, J. B. Weber, E. A. Wernsman, J. A. Weybrew, A. D. Worsham; *Adjunct Professor:* W. E. Wessling; *Professor Emeritus:* G. K. Middleton; *Associate Professors:* J. C. Burns (USDA), T. H. Busbice (USDA), F. T. Corbin, W. T. Fike Jr., W. B. Gilbert, G. R. Gwynn (USDA), R. C. Long, C. F. Murphy, R. P. Patterson; *Assistant Professors:* J. W. Schrader, C. F. Tester (USDA), W. W. Weeks, J. C. Wynne; *Instructor:* C. Collins; *Associate Members of the Faculty:* E. C. Sisler (Biochemistry), T. J. Sheets (Entomology, Horticultural Science)

EXTENSION

Professor: G. L. Jones, *In Charge of Agronomy Extension*

Professors: C. T. Blake, S. H. Dobson, S. N. Hawks Jr., F. W. McLaughlin, A. Perry; *Professors Emeriti:* R. R. Bennett, A. D. Stuart; *Associate Professors:* J. G. Clapp Jr., H. D. Coble, W. G. Tommey; *Assistant Professors:* E. L. Kimbrough, E. G. Krenzer Jr., G. A. Sullivan; *Assistant Professor Emeritus:* R. H. Crouse

The increase in human populations, the continuing evolution of pests and diseases, the challenge of new natural and artificial environments and the decrease of farmland are all critical current world issues.

This department's curricula was designed to give the crop science major an awareness and a sense of personal involvement in these issues. The student receives a working knowledge of the fundamental principles of plant science which tend to shape modern crop production practices. He is trained in the economics of various crop management procedures which may influence long-range investments.

OPPORTUNITIES

With cash crops returning nearly one billion dollars to the annual farm income of North Carolina, the opportunities within the state for crop science graduates in county extension programs, in farm management, as salesmen of seed and agricultural chemicals and in the several governmental agencies remain good. Demand for qualified students in national and international concerns is increasing.

For crop science graduate programs, see pages 12-14.

UNDERGRADUATE CURRICULUM

The degree of Bachelor of Science with a major in crop science is offered under the science curricula of the School of Agriculture and Life Sciences. The science curriculum follows.

Students may also earn a Bachelor of Science under the technology curriculum with a major in agronomy. The agronomy option is administered jointly by the Departments of Crop Science and Soil Science. For that curriculum, see page 52.

The Departments of Crop Science, Entomology, Horticultural Science and Plant Pathology offer a joint undergraduate major in pest management (for crop protection). See pages 75-77 for details.

CURRICULUM IN CROP SCIENCE

For the freshman year and basic requirements, see pages 47-52.

SCIENCE PROGRAM

Physical and Biological Sciences

		Credits
MA 111	Algebra and Trigonometry	4
MA 112	Analytic Geometry and Calculus A	4
BO 200	Plant Life	4

Group A, B, & C Courses (24 credits)

CH 221	Organic Chemistry I	4
CH 223	Organic Chemistry II	4
GN 411	The Principles of Genetics	3
GN 412	Elementary Genetics Laboratory	1
MA 114	Topics in Modern Math or	
MA 212	Analytic Geometry and Calculus B	3
MB 401	General Microbiology	4
PP 315	Plant Diseases	3
Electives in A, B, or C Courses		2

Departmental Requirements and Electives (27 credits)

		Credits
BO 421	Plant Physiology	4
CS 211	Crop Science	4
CS 214	Crop Science Lab	1
CS 312	Pastures and Forage Crops	3
CS 414	Weed Science	3
CS 490	Senior Seminar in Crop Science	1
ENT 312	Introduction to Economic Insects	3
SSC 200	Soil Science	4
Soil Science Electives		3
Elective		1
Total Hours for Graduation		130

Dairy Science

(See Animal Science, pages 53-55.)

Economics and Business

Patterson Hall

Professor W. D. Toussaint, *Head of the Department*

Professor B. M. Olsen, *Assistant Head of the Department*

TEACHING AND RESEARCH

Professors: A. J. Bartley, A. J. Coutu, E. W. Erickson, D. M. Hoover, L. A. Ihnen, G. D. Irwin (USDA), P. R. Johnson, R. A. King, G. A. Mathia, E. C. Pasour Jr., R. A. Schrimper, J. A. Seagraves, R. L. Simmons, J. G. Sutherland (USDA), C. B. Turner, J. C. Williamson Jr.; *Adjunct Professor:* D. R. Dixon; *Professors Emeriti:* E. W. Swanson, T. W. Wood; *Associate Professors:* D. S. Ball, J. B. Bullock, G. A. Carlson, J. S. Chappell, M. M. El-Kammash, R. M. Fearn, B. L. Gardner, H. C. Gilliam Jr. (USDA), C. W. Harrell Jr., D. N. Hyman, T. Johnson, C. P. Jones, E. W. Jones, F. A. Mangum Jr., R. J. Peeler Jr., R. K. Perrin, J. C. Poindexter Jr., R. E. Sylla, J. W. Wilson; *Assistant Professors:* L. E. Danielson, L. M. Ennis Jr., A. R. Gallant, T. J. Grennes, J. S. Lapp, R. B. McBurney Jr., M. B. McElroy, L. B. Perkinson (USDA), W. P. Pinna; *Assistant Professors Emeriti:* J. C. Matthews Jr., O. G. Thompson; *Instructors:* A. M. Beals Jr., W. W. Brooks, S. K. Happel, M. R. Hilliard, M. T. Holcomb, D. M. Holmes, J. M. Jeffreys, S. K. Palmer; *Special Lecturer:* W. P. Windham; *Associate Members of the Faculty:* D. L. Holley (Forestry), W. D. Cooper (Textile Technology)

EXTENSION

Professor F. D. Sobering, *In Charge Extension Economics*

Professors: R. C. Brooks, G. L. Capel, D. G. Harwood Jr., T. E. Nichols Jr., E. A. Proctor, C. R. Pugh, W. L. Turner, C. R. Weathers, R. C. Wells; *Associate Pro-*

fessors: J. G. Allgood, R. S. Boal, R. D. Dahle, L. H. Hammond, H. A. Homme, J. E. Ikerd, H. L. Liner, D. F. Neuman, P. S. Stone; *Assistant Professor:* J. E. Easley Jr.; *Assistant Professors Emeriti:* E. M. Stallings, R. P. Uzzle; *Instructor:* D. C. Pardue

Agricultural economics, leading to a B.S. degree, is one of several fields of specialization offered by the Department of Economics and Business. The department is administered jointly by the Schools of Agriculture and Life Sciences and Liberal Arts. For information on fields of economics and business other than agricultural economics see Liberal Arts, pages 153-156.

The department's general objectives in agricultural economics are: 1) To train students in the fundamentals of business organization and to make sound decisions in organizing and managing farms and other agricultural businesses; 2) To instruct students in economic theory which may be used as a basis for understanding the relationship of agriculture to other parts of the economy and for the evaluation of agricultural policy and economic changes which affect agriculture; 3) To train graduate students in advanced economic theory and research techniques. For a list of graduate degrees, see pages 12-14.

OPPORTUNITIES

The growing number of companies processing and manufacturing agricultural products has created an increasing demand for people trained in agricultural economics. Opportunities include employment by companies handling farm supplies, such as feed, fertilizer and equipment; general marketing and processing firms; agricultural cooperatives; professional farm management agencies, and various credit agencies.

Many graduates are employed in research and educational work by various agencies of the Federal and state governments. These include the Agricultural Extension Service, the Agricultural Experiment Station, the State Department of Agriculture and other agencies of the United States Department of Agriculture.

UNDERGRADUATE CURRICULA

The degree of Bachelor of Science with a major in economics and business may be obtained in either the science curriculum or the business curriculum. Students must meet all basic University requirements and Agriculture and Life Sciences requirements. The science program is for those desiring a strong background in the physical and biological sciences or preparation for graduate work. The business program is for students who have career interests in agriculturally-related businesses.

SCIENCE PROGRAM

For the basic requirements in the science curriculum, see page 48.

Departmental Requirements
(26 credits)

EC 301 Production and Prices 3
EC 302 Aggregate Economic Analysis: Theory and Policy 3
ACC 260 Accounting I—Concepts of Financial Reporting 3
Production elective 3
  EC 303 Farm Management
  EC 325 Industrial Management
  EC 551 Agricultural Production Economics
Marketing elective 3
  EC 311 Agricultural Markets
  EC 313 Marketing Methods
  EC 521 Markets and Trade
Finance elective 3
  EC 304 Financial Institutions
  EC 415 Farm Appraisal and Finance
  EC 420 Corporation Finance

*Group A, B and C Requirements**
(54 Credits)

MA 111 Algebra and Trigonometry 4
MA 112 Analytic Geometry and Calculus A 4
MA 212 Analytic Geometry and Calculus B 3
ST 311 Introduction to Statistics 3
or

EC 317 Introduction to Methods of Economic Analysis
Chemistry, Physics and biological science requirements 21
Group A electives 13
Group A or B or C electives 6
Policy elective 3
EC 413 Competition, Monopoly and Public Policy
EC 533 Agricultural Policy
Electives in support of major 5

*Group D Requirements** *(21 credits)*

EC 212 Economics of Agriculture 3
EC 202 Economics II 3
Group D electives 15

* Group A includes the physical and biological sciences; Group B, economics and business management; Group C, applied science and technology; Group D, social sciences and humanities.

BUSINESS PROGRAM

A typical curriculum in the agricultural economics business program follows on pages 67-68. It details credit hours of required courses and electives from Group A (physical and biological sciences), Group C (applied science and technology) and Group D (social sciences and humanities). Group B (economics and business management) and departmental requirements are as follows:

Departmental and Group B Requirements (50 credits)

EC 301 Production and Prices 3
EC 302 Aggregate Economic Analysis: Theory and Policy 3
ACC 260 Accounting I—Concepts of Financial Reporting 3
ST 311 Introduction to Statistics 3
or
EC 317 Introduction to Economic Analysis
Production elective 3
EC 303 Farm Management
EC 325 Industrial Management
EC 551 Agricultural Production Economics
Marketing elective 3
EC 311 Agricultural Markets
EC 313 Marketing Methods
EC 521 Markets and Trade
Finance elective 3
EC 304 Financial Institutions
EC 415 Farm Appraisal and Finance
EC 420 Corporation Finance
Personnel elective 3
EC 326 Personnel Management
EC 332 Industrial Relations
EC 431 Labor Economics
Policy elective 3
EC 413 Competition, Monopoly and Public Policy
or
EC 533 Agricultural Policy
Group B electives 3
Other electives in support of major 20

A typical business program in economics follows, however, there is flexibility in the agricultural economics major. Approximately 25 percent of the student's total course work is selected by the student in consultation with the major adviser. This flexibility permits each student to develop a strong background in business and economics and at the same time concentrate in a supporting area of major interest such as conservation, crops and soils, livestock and poultry, or processing of agricultural products. It also facilitates the fulfilling of the requirements for a major in other departments at the same time the degree in agricultural economics is being earned.

TYPICAL CURRICULUM IN AGRICULTURAL ECONOMICS

BUSINESS PROGRAM

For the freshman year see page 47.

SOPHOMORE YEAR

Credits

*EC 212 Economics of Agriculture 3
*EC 202 Economics II 3
ACC 260 Accounting I—Concepts of Financial Reporting 3
*PY 221 College Physics 5
*SP 231 Expository Speaking 3
English elective 3
Biological sciences elective 4
Social sciences and humanities electives ... 6
Physical Education 2
32

JUNIOR YEAR

	Credits
EC 301 Production and Prices	3
EC 302 Aggregate Economic Analysis	3
ST 311 Introduction to Statistics	3
Business elective (production)	3
Business elective (marketing)	3
Physical, Biology or Technical electives	5
Social sciences and humanities electives	3
Departmental electives	7
Elective	4
	34

SENIOR YEAR

	Credits
Business elective (finance)	3
Business elective (personnel)	3
Business electives	9
Economic policy elective	3
Departmental electives	7
Electives	8
	33
Total Hours for Graduation	130

* These courses and those listed in the freshman year make up the business program required courses in languages, social sciences and humanities and physical and biological sciences. For business electives, see page 50.

Entomology

Gardner Hall

Professor Kenneth L. Knight, *Head of the Department*

TEACHING AND RESEARCH

Professors: R. C. Axtell, C. H. Brett, W. V. Campbell, W. C. Dauterman, M. H. Farrier, F. E. Guthrie, Ernest Hodgson, W. J. Mistric Jr., H. H. Neunzig, R. L. Rabb, T. J. Sheets, C. F. Smith, D. A. Young Jr.; *Adjunct Professors:* J. R. Fouts, L. M. Russell; *Professor Emeritus:* T. B. Mitchell; *Associate Professors:* J. R. Bradley Jr., W. M. Brooks, H. B. Moore Jr., G. C. Rock, C. G. Wright, R. T. Yamamoto; *Adjunct Associate Professor:* A. L. Chasson; *Assistant Professor:* R. E. Stinner; *Associate Member of the Faculty:* D. S. Grosch

EXTENSION

Professor: G. T. Weekman, *Specialist-in-Charge*

Professors: R. L. Robertson, H. E. Scott, F. E. Whitfield; *Professor Emeritus:* G. D. Jones; *Associate Professor:* J. M. Falter; *Assistant Professors:* J. R. Baker, R. C. Hillmann, K. A. Sorensen, J. Van Duyn

The entomology curriculum offers broad training at the undergraduate and graduate levels (see pages 12-14) in basic biology and related sciences, particularly as they relate to the study of insects. In addition, a course in insect control technology is offered at the undergraduate level for non-majors.

OPPORTUNITIES

Research positions are available in many universities as well as with federal and state government and private industry. The need for college teachers is also great. Other opportunities include development, production, control and sales positions in the pesticide field, consultative positions in pest management, and regulatory and extension positions with state and federal agencies.

UNDERGRADUATE CURRICULUM

The degree of Bachelor of Science with a major in entomology is offered under the science curriculum of the School of Agriculture and Life Sciences. Students are

encouraged to major in biological sciences and devote their electives to entomology courses. For the joint undergraduate major in pest management (for crop protection) see pages 75-77.

TYPICAL CURRICULUM IN ENTOMOLOGY

SCIENCE PROGRAM

For the freshman year and basic requirements, see pages 47-52.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 103 General Chemistry II or CH 107 Principles of Chemistry	4	*ENT 312 Introduction to Economic Insects	3
Literature Elective	3	English or Modern Language Elec.	3
SSC 200 Soil Science or *GY 120 Physical Geology	4	Group D Elective	3
Group D Elective	3	Free Elective	3
Advised Elective	3	Advised Elective	4
Physical Education	1	Physical Education	1
	16-18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PY 221 College Physics	5	*BCH 351 Elementary Biochemistry	3
*CH 220 Introductory Organic Chemistry	4	*ST 311 Introduction to Statistics	3
*ZO 421 Vertebrate Physiology	3	*GN 411 The Principles of Genetics	3
Group D Elective	3	Group D Elective	3
	15	Free Elective	3
			15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*ENT 502 Insect Diversity	4	*ENT 503 Functional Systems of Insects	4
*ENT (ZO) 401 Bibliographic Research in Biology	1	*BO (ZO) 360 Introduction to Ecology	4
Group D Elective	3	Free Elective	3
Free Elective	3	Advised Electives	6
Advised Electives	6		17
	17	Total Hours for Graduation	130

* Group A courses and departmental requirements and electives.

Food Science

Schaub Food Science Building

Professor W. M. Roberts, *Head of the Department*

TEACHING AND RESEARCH

Professors: L. W. Aurand, T. A. Bell (USDA), T. N. Blumer, H. B. Craig, J. L. Etchells, M. W. Hoover, A. E. Purcell (USDA), M. L. Speck, H. E. Swaisgood, F. G. Warren; *Professor Emeritus:* I. D. Jones; *Associate Professors:* H. R. Ball Jr., D. E. Carroll Jr., H. P. Fleming (USDA), S. E. Gilliland, D. D. Hamann, A. P. Hansen, V. A. Jones, W. M. Walter Jr. (USDA), N. B. Webb; *Assistant Professors:* D. M. Adams Jr., G. G. Giddings, B. R. Johnson; *Adjunct Assistant Professor:* W. Y. Cobb; *Instructor:* L. G. Turner

EXTENSION

Professors: J. A. Christian, E. Cofer, M. E. Gregory, N. C. Miller Jr., F. B. Thomas; *Associate Professors:* M. K. Head, F. R. Tarver Jr.; *Assistant Professor:* M. K. Hill; *Specialists:* R. E. Carawan, T. M. Miller

The Department of Food Science provides undergraduate and graduate programs for the application and coordination of the physical and biological sciences, economics and engineering to the development, processing, packaging, quality control, distribution and utilization of foods.

The department maintains modern fully equipped laboratories for teaching and research in food microbiology and fermentation, food chemistry, food engineering and dairy, fruit, meat, poultry, seafood and vegetable products.

OPPORTUNITIES

Increasing consumer demands for greater varieties and quantities of highly nutritious and convenience foods of uniformly high quality create many varied career opportunities in the food and allied industries.

Food industries career opportunities are: management, research and development, process supervision, quality control, procurement, distribution, sales and merchandising. Positions include sales and services in allied industries, consulting and trade association activities and promotional and educational services.

Food Science graduates hold teaching, research and extension positions with colleges and universities. Governmental agencies employ food scientists whose work is directed toward research, regulatory control and the development of food standards.

UNDERGRADUATE CURRICULUM

The degree of Bachelor of Science with a major in food science is offered under the science or technology curriculum of the School of Agriculture and Life Sciences.

For graduate degrees offered, see pages 12-14.

CURRICULA IN FOOD SCIENCE

SCIENCE PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ALS 103 Introductory Topics ALS	1	MA 112 Analytic Geometry and Calculus A	4
MA 111 Algebra and Trigonometry	4	ENG 112 Composition and Reading	3
ENG 111 Composition and Rhetoric	3	CH 107 Principles of Chemistry	4
CH 101 General Chemistry I	4	BS 100 General Biology	4
Social Science and Humanities Elective	3	Physical Education	1
Physical Education	1		
	16		16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 212 Analytic Geometry and Calculus B	3	CH 223 Organic Chemistry II	4
CH 221 Organic Chemistry I	4	PY 212 General Physics	4
*FS 201 Food Science and Technology	3	MB 401 General Microbiology	4
PY 211 General Physics	4	Literature Elective	3
Social Science and Humanities Elective	3	Physical Education	1
Physical Education	1		
	18		16

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*FS (BAE) 331 Food Engineering	3	Food Science Elective	3
*FS 402 Food Chemistry	3	Group A Electives	6
*FS (MB) 405 Food Microbiology	3	Social Science and Humanities Electives	6
Language Elective	3	Free Elective	3
Free Elective	3		
	15		18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Food Science Electives	6	Food Science Electives	5
Group A Elective	2	Group A Electives	3
Social Science and Humanities Electives	6	Social Science and Humanities Elective	3
Free Electives	3	Free Elective	3
	17		14

Total Hours For Graduation 130

* Departmental requirements.

TECHNOLOGY PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ALS 103 Introductory Topics ALS	1	MA 112 Analytic Geometry and Calculus A	4
MA 111 Algebra and Trigonometry	4	ENG 112 Composition and Reading	3
ENG 111 Composition and Rhetoric	3	CH 103 General Chemistry II	
CH 101 General Chemistry I	4	or	
Social Science and Humanities Elective	3	CH 107 Principles of Chemistry	4
Physical Education	1	BS 100 General Biology	4
	16	Physical Education	1
			16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 114 Topics in Modern Mathematics	3	CH 223 Organic Chemistry II	
CH 221 Organic Chemistry I		or	
or		CH 315 Quantitative Analysis	4
CH 220 Introductory Organic Chemistry	4	PY 221 College Physics	5
*FS 201 Food Science and Technology	3	MB 401 General Microbiology	4
Social Science and Humanities Electives	6	Literature Elective	3
Physical Education	1	Physical Education	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*FS (BAE) 331 Food Engineering	3	Food Science Elective	3
*FS 402 Food Chemistry	3	SP 231 Expository Speaking	3
*FS (MB) 405 Food Microbiology	3	Social Science and Humanities Elective	3
Social Science and Humanities Elective	3	Group A, B, or C Electives	6
Free Elective	3	Free Elective	3
	15		18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Food Science Electives	6	Food Science Electives	6
Social Science and Humanities Elective	3	Social Science and Humanities Elective	3
Group A, B, or C Elective	3	Group A, B, or C Electives	4
Free Elective	3	Free Elective	3
	15		16

Total Hours for Graduation 130

* Departmental requirements.

Genetics

Gardner Hall

Professor D. F. Matzinger, *Acting Head of the Department*

Professors: D. S. Grosch, W. D. Hanson, C. S. Levings III, T. J. Mann, L. E. Mettler, R. H. Moll, T. Mukai, G. Namkoong (USFS), H. E. Schaffer, B. W. Smith, S. G. Stephens, A. C. Triantaphyllou; *Adjunct Professor:* H. V. Malling; *Professor Emeritus:* C. H. Bostian; *Associate Professors:* L. G. Burk (USDA), W. E. Kloos, C. W. Stuber (USDA); *Assistant Professor:* W. H. McKenzie; *Associate Geneticist:* M. P. Gregory; *Associate Members of the Faculty:* E. U. Dillard, E. J. Eisen, J. E. Legates, B. T. McDaniel, O. W. Robison (Animal Science); F. B. Armstrong (Biochemistry and Microbiology); C. A. Brim (USDA), J. F. Chaplin (USDA), W. A. Cope (USDA), D. A. Emery, D. U. Gerstel, W. C. Gregory, G. R. Gwynn (USDA), P. H. Harvey, J. A. Lee (USDA), P. A. Miller, C. F. Murphy, L. L. Phillips, C. F. Tester (USDA), D. L. Thompson (USDA), D. H. Timothy, E. A. Wernsman (Crop Science); C. C. Cockerham, M. M. Goodman, J. O. Rawlings (Statistics); J. W. Duffield, T. O. Perry, L. C. Saylor, B. J. Zobel (Forestry); F. D. Cochran, G. J. Galletta, F. L. Haynes Jr., (Horticultural Science); J. L. Apple, T. T. Herbert, N. T. Powell (Plant Pathology); D. M. Briggs, E. W. Glazener, G. A. Martin (Poultry Science)

The genetics faculty offers instruction at advanced undergraduate and graduate levels. The undergraduate courses are designed to support other departments, giving students a background in genetics. The graduate program is designed to train scientists for research and teaching careers in basic genetics and in its application in plant and animal breeding. For graduate degrees offered, see pages 12-14.

CURRICULUM

Since there is no genetics baccalaureate program, undergraduates are encouraged to pursue a biological sciences program.

Horticultural Science

Kilgore Hall

Professor J. W. Strobel, *Head of the Department*

TEACHING AND RESEARCH

Professors: W. E. Ballinger, F. D. Cochran, F. E. Correll, G. J. Galletta, F. L. Haynes Jr., R. A. Larson, R. L. Lower, C. H. Miller, P. V. Nelson; *Research Professor:* D. T. Pope; *Adjunct Professor:* R. L. Sawyer; *Professors Emeriti:* M. E. Gardner, J. M. Jenkins Jr., G. O. Randall; *Associate Professors:* T. F. Cannon, W. R. Henderson, T. R. Konsler, T. J. Monaco, W. B. Nesbitt, C. R. Unrath, D. C. Zeiger; *Assistant Professors:* L. K. Hammett, D. M. Pharr, R. M. Southall; *Instructor:* V. H. Underwood; *Associate Members of the Faculty:* R. J. Downs (Botany); T. J. Sheets (Entomology, Crop Science); R. H. Moll (Genetics); R. Aycock (Plant Pathology); R. J. Volk (Soils)

EXTENSION

Professor A. A. Banadyga, *In Charge*

Professors: M. H. Kolbe, J. W. Love, W. A. Skroch; *Professors Emeriti:* H. M. Covington, J. H. Harris; *Associate Professors:* J. F. Brooks, G. R. Hughes, C. M. Mainland, W. W. Reid, H. J. Smith; *Assistant Professors:* M. A. Cohen, D. C. Sanders, J. H. Wilson Jr.

Undergraduate programs in horticultural science offer broad training in physical and biological sciences and business and a sound cultural background. Students can concentrate studies in the areas of fruit and vegetable crops, floriculture, nursery management, or landscape horticulture. They are prepared for either graduate study (see pages 12-14) or for diverse professional service.

North Carolina's varied climatic conditions make possible the production of a wide variety of horticultural crops on a commercial scale, as well as in parks and gardens. These crops now represent an important segment of N. C. agriculture with further expansion to be realized with the development of adapted varieties, mechanization and intensification of cultural practices, improvement of handling and marketing methods and the development of the food processing industry.

OPPORTUNITIES

Horticulture graduates fill positions in production, processing, sales and service. Among these are county extension agents; vocational agricultural teachers; landscaping and landscape contracting; farm operators; orchard, nursery, greenhouse and flower shop managers; research, production and promotional specialists with commercial seed, floral, fertilizer, chemical and food companies; inspectors and quality control technologists; USDA specialists and as leaders in other phases of agricultural and industrial developments. The student may also prepare for a career in research, teaching, extension, etc. in horticulture.

UNDERGRADUATE CURRICULUM

The degree of Bachelor of Science with a major in horticultural science can be earned in one of the three curricula—business, science, or technology—offered by the School of Agriculture and Life Sciences. Under these curricula, specialized training is offered in fruit and vegetable crops, and in floriculture, ornamental horticulture (nursery management), and landscape horticulture. (There is also a joint undergraduate major in pest management for crop protection; see pages 75-77.)

For the freshman year and basic requirements, see pages 47-52.

For the business curriculum see page 48. Twenty four credit hours of business courses are substituted for an equal number of hours in the technology curriculum.

TYPICAL CURRICULA IN HORTICULTURAL SCIENCE

SCIENCE PROGRAM

SOPHOMORE YEAR

		Credits		
		*FV**	*OH**	*F**
BO 200	Plant Life	4	4	4
CH 103	General Chemistry II	4	4	4
CH 220	Introductory Organic Chemistry	4	4	4
HS 211, 212	Ornamental Plants		6	6
HS 301	Plant Propagation		3	3
PY 221	College Physics	5	5	5
	Social Science and Humanities Electives	9		
SSC 200	Soil Science	4	4	4
HS 201	Principles of Horticulture	3	3	3
	Physical Education	2	2	2
			35	35	35

JUNIOR YEAR

		Credits		
		*FV**	*OH**	*F**
BO 421	Plant Physiology	4	4	4
ENT 312	Introduction to Economic Insects	3	3	3
GN 411	The Principles of Genetics	3	3	3
GN 412	Elementary Genetics Laboratory	1	1	1
MB 401	General Microbiology	4	4	4
	Modern Language or English Elective	6	6	6
PP 315	Plant Diseases	3	3	3
	Social Science and Humanities Electives	3		
SSC 341	Soil Fertility and Fertilizers		3	3
	Free Electives	6	6	6
			33	33	33

SENIOR YEAR

		Credits FV*	OH*	F*
HS 411	Nursery Management		3	
HS 421	Fruit Production	3		
HS 432	Vegetable Production	3		
HS 411, 442	Floriculture I, II			6
HS 471	Arboriculture		3	
HS 491	Senior Seminar in Horticultural Science	1	1	1
HS (FS) 562	Post-Harvest Physiology	3		
	Social Science and Humanities Electives	3	15	15
	Advised Electives	12	3	3
	Free Electives	6	6	6
		31	31	31
	Total Hours for Graduation			130

*FV—Fruits and Vegetables, OH—Ornamental and Landscape Horticulture, F—Floriculture

TECHNOLOGY PROGRAM

SOPHOMORE YEAR

		Credits FV*	OH*	F*
BO 200	Plant Life	4	4	4
CH 103	General Chemistry II	4	4	4
EC 201	Economics I	3	3	3
HS 211, 212	Ornamental Plants		6	6
HS 301	Plant Propagation	3	3	3
PY 221	College Physics	5	5	5
SP 231	Expository Speaking	3	3	3
	Social Science and Humanities Electives	6		
SSC 200	Soil Science	4	4	4
	Physical Education	2	2	2
		34	34	34

JUNIOR YEAR

		Credits FV*	OH*	F*
BO 421	Plant Physiology	4	4	4
EC 212	Economics of Agriculture	3	3	3
ENT 312	Introduction to Economic Insects	3	3	3
GN 411	The Principles of Genetics	3	3	3
GN 412	Elementary Genetics Laboratory	1	1	1
HS 414	Residential Landscaping		4	
	Modern Language or English Elective	3		3
PP 315	Plant Diseases	3	3	3
SOC 202	Principles of Sociology	3	3	3
SSC 341	Soil Fertility and Fertilizers	3	3	3
	Free Elective	6	6	6
		32	33	32

SENIOR YEAR

		Credits FV*	OH*	F*
HS 411	Nursery Management		3	
HS 421	Fruit Production	3		
HS 432	Vegetable Production	3		
HS 441, 442	Floriculture I, II			6
HS 471	Arboriculture		3	
HS 491	Senior Seminar in Horticultural Science	1	1	1
HS (FS) 562	Post-Harvest Physiology	3		
	Modern Language or English Elective		3	
	Social Science and Humanities Electives		6	6
	Departmental Elective	14	8	11
	Technical Elective	3	3	3
	Free Elective	6	6	6
		33	33	33
	Total Hours for Graduation			130

*FV — Fruits and Vegetables
OH — Ornamental and Landscape Horticulture
F — Floriculture

Medical Technology

Gardner Hall

G. C. Miller, *Major Adviser*

North Carolina State University has two parallel programs in medical technology. One is a four-year curriculum with a Bachelor of Science in zoology followed by a year of training in a hospital laboratory school.

The second program is designed to be completed in four calendar years. The student takes a prescribed curriculum for three years at North Carolina State University. The fourth year consists of a 12-month course in medical technology at the University of North Carolina in Chapel Hill or other approved institutions. Upon completion, a Bachelor of Science degree will be granted from N. C. State and a certificate in medical technology from the approved institution. (See zoology, pages 84-87.)

Microbiology

Gardner Hall

Professor J. B. Evans, *Head of the Department*

Professors: W. J. Dobrogosz, G. H. Elkan, P. B. Hamilton, J. J. Perry; *Adjunct Associate Professors:* R. E. Kanich, J. J. Tulis; *Assistant Professor:* E. C. Hayes III, G. H. Luginbuhl; *Associate Members of the Faculty:* J. G. Lecce, J. J. McNeill (Animal Science); F. B. Armstrong (Biochemistry); J. L. Etchells, M. L. Speck (Food Science); W. E. Kloos (Genetics); A. G. Wollum II (Soil Science)

The microbiology program provides basic preparation for professional microbiologists, a microbiology background for students in other sciences, and an awareness of the microbial world as it relates to our daily lives for non-science majors.

Microbiology is concerned with the growth and development, physiology, classification, ecology, genetics and other aspects of the life processes of an array of tiny, generally single-celled, organisms. These organisms may serve as model systems for elucidation of fundamental processes that are common to all living cells.

Most of the major discoveries that have produced the spectacular advances in biology during the past decade have resulted from studies of microbial systems. Future developments in environmental quality, production of food and fuel, and human health, will rely heavily on understanding microbial processes.

OPPORTUNITIES

Microbiologists are employed in research laboratories, diagnostic and control laboratories, teaching, and technical sales and service positions.

CURRICULUM

There is no microbiology undergraduate major, so students with a primary interest in microbiology are advised to take the biological sciences curriculum (see pages 59-61) and to devote their electives to biochemistry, chemistry, mathematics and microbiology. Generally as few as 12 credits in microbiology may be recommended. However, if a student does not plan to go beyond the Bachelor of Science level, and desires to qualify for registration or a civil service position as a microbiologist, 20 credits in microbiology should be taken.

For graduate degree programs, see pages 12-14.

Pest Management (for Crop Protection)

Gardner, Kilgore and Williams Halls

D. A. Emery, *Major Adviser, Department of Crop Science*
K. L. Knight, *Major Adviser, Department of Entomology*
T. J. Monaco, *Major Adviser, Department of Horticultural Science*
L. T. Lucas, *Major Adviser, Department of Plant Pathology*

The major in pest management (for crop protection) is an interdepartmental program involving crop science, entomology, horticultural science and plant pathology.

Students in pest management for crop protection receive training in the concepts of controlling crop pests in an ecologically sound manner. Crop losses from diseases, insects, nematodes and weeds annually run into the billions of dollars in the United States. Environmental concerns dictate that control efforts against these organisms must be integrated into a total crop production management program on a systems approach basis. A high degree of flexibility in electives permits the student either to become generally proficient across the field or to develop an area of strength against a particular class of pest organisms.

OPPORTUNITIES

Opportunities basically involve improving farm efficiency to meet our ever-growing need for food and fiber. Current federal and state statutes require a high degree of expertise in the accomplishment of pest control. Completion of the training provided by this curriculum qualifies the graduate for positions as county extension agents, as federal and state regulatory agents, as technicians in scientific research organizations, as pest control specialists in agribusiness concerns, and as custom pest management operators.

UNDERGRADUATE CURRICULUM

The degree of Bachelor of Science with a major in pest management (for crop protection) is offered under the agricultural science curriculum of the School of Agriculture and Life Sciences.

For the freshman year and basic requirements see pages 47-52.

TYPICAL CURRICULUM IN PEST MANAGEMENT

For the freshman year see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
SSC 200 Soil Science	4	CH 103 General Chemistry II	4
CH 101 General Chemistry I	4	or	
Literature Elective	3	CH 107 Principles of Chemistry	4
Group D Elective	3	English or Modern Language Elective	3
Advised Elective	3	CS 211 Crop Science	4
Physical Education	1	Group D Elective	3
	—	Free Elective	3
	18	Physical Education	1
			—
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 220 Introductory Organic Chem.	4	BCH 351 Elementary Biochemistry	3
PY 221 College Physics	5	BO (ZO) 360 Introduction to Ecology	4
PP 315 Plant Diseases	3	ENT 312 Introduction to Economic Insects	3
Group D Elective	3	Group D Elective	3
	—	Free Elective	3
	15		—
			16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENT 550 Fundamentals of Insect Control	3	PP 500 Plant Disease Control	3
CS 414 Weed Science	3	CS (HS) 514 Principles and Methods in Weed Science	3
Group D Elective	3		

Advised Electives	5
Free Elective	3
	17

BS 495 Special Topics in Biology	3
BO 421 Plant Physiology	4
Free Elective	3
	16
Total Hours for Graduation	130

Plant Pathology

Gardner Hall

Professor R. Aycock, *Head of the Department*

TEACHING AND RESEARCH

Professors: J. L. Apple, K. R. Barker, C. N. Clayton, E. B. Cowling, E. Echandi, G. V. Gooding Jr., T. T. Hebert, C. S. Hodges Jr. (USFS), G. B. Lucas, R. D. Milholland, L. W. Nielsen, N. T. Powell, J. P. Ross (USDA), J. N. Sasser, H. W. Spurr Jr. (USDA), D. L. Strider, H. H. Triantaphyllou, N. N. Winstead; *Professors Emeriti:* D. E. Ellis, C. J. Nusbaum, F. L. Wellman; *Adjunct Professor:* G. H. Hepting; *Associate Professors:* M. K. Beute, L. F. Grand, A. S. Heagle (USDA), S. F. Jenkins Jr., K. J. Leonard (USDA), M. P. Levi, L. T. Lucas, C. E. Main, R. A. Reinert (USDA), R. E. Welty (USDA); *Adjunct Associate Professors:* E. R. French, J. W. Koenigs, E. G. Kuhlman; *Assistant Professors:* D. M. Benson, N. S. Henderson, C. G. Van Dyke; *Adjunct Assistant Professor:* N. A. Lapp; *Associate Member of the Faculty:* C. B. Davey (Forestry)

EXTENSION

Associate Professor H. E. Duncan, *In Charge*

Professors: F. A. Todd, J. C. Wells; *Professor Emeritus:* H. R. Garriss; *Associate Professor:* C. W. Averre III; *Assistant Professors:* R. K. Jones, P. B. Shoemaker, J. H. Wilson Jr.

Undergraduate instruction in plant pathology is designed to provide introductory and advanced courses on the nature and control of plant diseases to students majoring in crop science, horticultural science, pest management, agricultural education and forestry. It can also provide fundamental training necessary for graduate study in plant pathology.

The Department of Plant Pathology cooperates in training pest management majors, but does not offer an undergraduate major in plant pathology. For graduate degrees offered, see pages 12-14.

OPPORTUNITIES

Employment in research, extension and teaching is available to graduates with advanced degrees in plant pathology. Research openings are with the U. S. Department of Agriculture, state experiment stations and in industry. The rapid development of agricultural chemicals and other methods for disease control offers numerous opportunities. See pest management (for crop protection), pages 75-77.

Poultry Science

Scott Hall

Professor R. E. Cook, *Head of the Department*

TEACHING AND RESEARCH

Professors: H. L. Bumgardner, W. E. Donaldson, E. W. Glazener, P. B. Hamilton, C. H. Hill; *Professor Emeritus:* C. W. Barber; *Associate Professors:* C. R. Park-

hurst, J. P. Thaxton, J. B. Ward; *Adjunct Associate Professor:* T. B. Dameron Jr.; *Associate Professors Emeriti:* W. L. Blow, F. W. Cook; *Assistant Professors:* D. M. Briggs, F. W. Edens, J. D. Garlich, G. W. Morgan Jr., W. R. Prince; *Associate Members of the Faculty:* W. M. Colwell, D. G. Simmons (Veterinary Science)

EXTENSION

Professor W. C. Mills Jr., *In Charge*

Professors: W. G. Andrews, J. R. Harris, G. A. Martin, T. B. Morris; *Professor Emeritus:* C. F. Parrish; *Assistant Professor:* M. H. Gehle; *Instructor:* J. R. West; *Extension Specialist:* C. E. Brewer

The Department of Poultry Science provides instruction in the principles of poultry husbandry and in such related fields as nutrition, physiology, genetics and pathology.

Through teaching, research and extension the department serves students, poultrymen and allied industries. Poultry production has increased rapidly during the last two decades. Poultry ranks second in North Carolina as a source of agricultural income. North Carolina ranks fourth nationally in the production of poultry products; the climatic and economic conditions in the State provide a sound base for continued expansion.

OPPORTUNITIES

The change from small farm operations to large commercial poultry enterprises has created more specialized positions than there are available poultry graduates. Off-the-farm operations in activities such as processing and distribution offer new job opportunities. The allied industries—feed, equipment, financing and drugs—need more employees trained in poultry science. Graduates hold positions as managers and field representatives for businesses identified with or serving the poultry industry. Graduates are also employed in communication and public relations and as teachers and extension and research specialists. Some graduates have their own poultry business.

UNDERGRADUATE CURRICULUM

Students desiring the Bachelor of Science degree with a major in poultry science may choose any of three curricula offered by Agriculture and Life Sciences. (For graduate degrees, see pages 12-14.) One may obtain a double major in certain other curricula through careful use of electives and/or summer school attendance. The student should consult the undergraduate advisers in the departments concerned.

For the freshman year and basic requirements see pages 47-52.

POULTRY SCIENCE CURRICULUM

BUSINESS PROGRAM

This curriculum is for students desiring a background related to the operation and management of business firms on a sound economic basis. The general requirements for the business program are listed on page 48. In addition, there are 26 hours of departmental requirements. These requirements include the poultry courses listed in the science curriculum below. PO (ZO) 524, Comparative Endocrinology, is not required. Additions are PO 301, Evaluation of Live Poultry, and PO 402, Commercial Poultry Enterprises. CH 103, General Chemistry II, may be substituted for CH 107, Principles of Chemistry. Should this substitution be made, the student is

required to take CH 220, Introductory Organic Chemistry, instead of CH 221, Organic Chemistry I.

TYPICAL CURRICULUM IN POULTRY SCIENCE

SCIENCE PROGRAM

This curriculum is for the student interested in the basic biological and physical sciences. The student is better prepared for advanced study in various disciplines such as genetics, nutrition, physiology, and pathology. Several preveterinary students are currently enrolled in the curriculum.

For the freshman year, see page 47.

SOPHOMORE YEAR

	Credits
CH 101 General Chemistry I	4
CH 107 Principles of Chemistry	4
English Elective	3
PO 201 Poultry Science and Production	4
PY 221 College Physics	5
or	
PY 211, 212 General Physics	8
Social Science and Humanities Electives	9
Physical Education	2
	31 or 34

JUNIOR YEAR

	Credits
CH 221 Organic Chemistry I	4
GN 411 The Principles of Genetics	3
MB 401 General Microbiology	4
PO 405 Avian Physiology	4
Group A Elective	4
Group B or C Elective	3
Social Science and Humanities Electives	6
Free Electives	6
	34

SENIOR YEAR

	Credits
PO (VET) 401 Poultry Diseases	4
PO (FS) 404 Poultry Products	3
PO (ANS, NTR) 415 Comparative Nutrition	3
PO 490 Poultry Seminar	1
PO (GN) 520 Poultry Breeding	3
PO (ZO) 524 Comparative Endocrinology	4
Group A Elective (If PY 212 is not taken)	4 or 8
Group B or C Elective	3
Free Electives	6
	31 or 35
Total Hours for Graduation	130

TECHNOLOGY PROGRAM

This is a more generalized program of study as the curriculum offers a greater selection of courses in the applied science and technology areas. The sophomore and junior years are the same as for the science curriculum as modified by the changes noted in Group A and departmental requirements for the business curriculum. The Group D courses required in all programs are indicated on page 51.

SENIOR YEAR

	Credits
PO (VET) 401 Poultry Diseases	4
PO (FS) 404 Poultry Products	3
PO (ANS, NTR) 415 Comparative Nutrition	3
PO 490 Poultry Seminar	1
PO (GN) 520 Poultry Breeding	3
Group A Elective	4
Group A, B or C Electives	7 or 11
Free Electives	6
Total Hours for Graduation	130

Premedical Sciences

Gardner Hall

Premedical, predental and preveterinary curricula are offered in the School of Agriculture and Life Sciences. Requirements for all the premedical sciences are similar. Requirements may be met either through the science curriculum or the biological sciences curriculum. A number of students are accepted each year in leading medical colleges; several have received outstanding scholarships.

For further details on the preveterinary curriculum, see veterinary science, pages 82-83.

For the premedical and predental details, see zoology, pages 84-87, and the biological sciences curriculum, pages 59-61.

Sociology and Anthropology

(Also see Liberal Arts.)

1911 Building

Professor S. C. Mayo, *Head of the Department*

TEACHING AND RESEARCH

Professors: L. W. Drabick, C. P. Marsh, G. C. McCann, H. D. Rawls, J. N. Young; *Professor Emeritus:* C. H. Hamilton; *Associate Professors:* R. C. Brisson, W. B. Clifford II, A. C. Davis, C. V. Mercer, R. L. Moxley, R. D. Mustian, M. M. Sawhney, E. M. Suval, O. Uzzell; *Adjunct Associate Professors:* W. J. Buffaloe, R. L. Rollins Jr.; *Assistant Professors:* C. G. Dawson, G. L. Faulkner, T. M. Hyman, K. D. Kim, G. S. Nickerson, J. G. Peck, L. J. Rhoades, I. E. Russell, D. J. Steffensmeier, P. L. Tobin, M. L. Walek, J. M. Wallace, R. C. Wimberley; *Adjunct Assistant Professor:* J. L. Franklin; *Visiting Assistant Professor:* H. L. Adkins

EXTENSION

Associate Professor J. N. Collins, *In Charge of Community Development*

Professor: J. D. George; *Professor Emeritus:* J. W. Crawford; *Associate Professors:* T. N. Hobgood Jr., P. P. Thompson, M. E. Voland; *Assistant Professors:* J. A. Christenson, V. E. Hamilton, C. E. Lewis

This department aims to teach students the principles and techniques for understanding human group behavior. More specifically the department seeks: 1) to train students to become leaders in organizing groups and communities and in administering their programs; 2) to qualify exceptional students on the undergraduate and graduate levels for sociological research, teaching and extension work; 3) to solve problems in human group relations through scientific research; and 4) to extend research results to the people of the State.

UNDERGRADUATE CURRICULUM

The degree of Bachelor of Science with a major in sociology is offered under the science curriculum of the School of Agriculture and Life Sciences. Majors in this department are offered an option in criminal justice and a concentration in social work.

For graduate degrees, see pages 12-14.

CURRICULUM IN RURAL SOCIOLOGY

SCIENCE PROGRAM

For the freshman year and basic requirements see pages 47-52.

Group A Courses (26 credits)

GN 411	Principles of Genetics	
	or	
GN 301	Genetics in Human Affairs	3
GY 120	Physical Geology	3
ST 311	Introduction to Statistics	3
Electives*		17

Departmental Requirements and Electives (26 credits)

ANT 252	Cultural Anthropology	3
SOC 202	Principles of Sociology	3
SOC 301	Human Behavior	3
SOC 341	Rural Society—U.S.A.	3
SOC 342	Rural Societies Around the World	3
SOC 411	Community Relationships	3
SOC 416	Research Methods	3
Electives		8
Total Hours for Graduation		130

* Six credits may be elected from Groups B and C; additional electives from Group D.

Soil Science

Williams Hall

Professor C. B. McCants, *Head of the Department*

Professors: S. W. Buol, M. G. Cook, R. B. Daniels (USDA), J. W. Fitts, W. A. Jackson, G. L. Jones, E. J. Kamprath, R. J. Volk, S. B. Weed, W. G. Woltz, W. W. Woodhouse Jr.; *Extension Professors:* J. V. Baird, J. A. Phillips; *Adjunct Professors:* L. J. Metz, C. G. Wells; *Professors Emeriti:* W. V. Bartholomew, J. F. Lutz; *Associate Professors:* G. R. Burns (USDA), D. K. Cassel, F. R. Cox, G. A. Cummings, E. E. Gamble (USDA), J. W. Gilliam, R. E. McCollum, P. A. Sanchez, A. G. Wollum II; *Associate Professors Emeriti:* W. D. Lee, A. Mehlich, J. R. Piland, W. H. Rankin; *Assistant Professors:* B. L. Carlile, C. K. Martin, G. S. Miner, G. C. Naderman, C. D. Raper Jr., J. F. Shelton, C. D. Sopher; *Extension Assistant Professor:* L. E. Aull; *Adjunct Assistant Professor:* D. W. Eaddy; *Associate Members of the Faculty:* R. W. Skaggs (Biological and Agricultural Engineering); E. D. Seneca (Botany); J. B. Weber (Crop Science); C. B. Davey (Forestry)

The Department of Soil Science trains students in fundamentals of soils, develops an understanding and appreciation of soils as a resource, and presents principles of soil management and utilization for both farm and non-agricultural purposes. Soils constitute one of the largest capital investments in farming and proper soil management is essential for efficient production. Future world food needs will require people conversant in soil resources and use of fertilizers. Soil properties are important considerations in urban-suburban planning and development. Also, knowledge of soil and its interactions with potential pollutants are useful in conserving environmental quality. Therefore, the demand for people trained in soils by agribusiness and educational, research, service, planning-development, and conservation-related agencies should continue to be great.

OPPORTUNITIES

Soil science graduates fill positions of leadership and service in agricultural, conservation and resource planning work. Among these are opportunities as farm operators and managers, county agricultural extension agents and employees of

other public advisory agencies, Soil Conservation Service and other conservation-related agencies concerned with soil resources, and as technical representatives and salesmen in fertilizer companies and other agri-business.

Provision is made for students wishing a more thorough training in biological sciences, chemistry, mathematics, and physics leading to graduate study. (For graduate degrees, see pages 12-14.) Students with advanced degrees have wide opportunities in teaching, research, service and extension with state, federal and private educational and research institutions and agencies. Also, there are increasing opportunities in support of agribusiness.

UNDERGRADUATE CURRICULUM

The Bachelor of Science degree may be obtained in the Department of Soil Science under any of three curricula—science, technology, or conservation. For the basic requirements and freshman year, see pages 47-52. The conservation curriculum is shown on pages 62-63. The agronomy curriculum is on page 52.

TYPICAL CURRICULUM IN SOIL SCIENCE

SCIENCE PROGRAM

SOPHOMORE YEAR

	Credits		
BO 200 Plant Life	4	GY 110 Physical Geography Laboratory	1
CH 107 Principles of Chemistry	4	Group D Electives	3
MA 112, 212 Analytic Geometry and Calculus A, B	7	Free Elective	3
English Elective	3	Physical Education	2
SSC 200 Soil Science	4		—
GY 120 Physical Geography	2		33

JUNIOR YEAR

	Credits		
Chemistry Elective	8	SSC 352 Soil Classification	4
English Elective	3	Group D Electives	6
PY 211, 212 General Physics	8		—
SSC 341 Soil Fertility and Fertilizers	3		33
SSC 342 Soil Fertility Laboratory	1		

SENIOR YEAR

	Credits		
BO 421 Plant Physiology	4	Free Electives	9
SSC 461 Soil and Water Conservation	3		—
SSC 462 Soil-Crop Management Systems	3		34
SSC 492 Senior Seminar in Soil Science	1	Total Hours for Graduation	130
Departmental Electives	8		
Group D Elective	6		

Veterinary Science

Grinnells Animal Health Laboratory

Professor T. M. Curtin, *Head of the Department*

Professors: E. G. Batte, W. M. Colwell; *Associate Professors:* D. J. Moncol, D. G. Simmons; *Associate Members of the Faculty:* R. F. Behlow, G. B. Creed (Animal Science); J. R. Harris (Poultry Science); K. E. Muse (Zoology)

The veterinary science faculty offers instruction at advanced undergraduate and graduate levels. Courses are designed to support other departments of the institution, giving students a background in animal health, poultry health and laboratory animal care.

PREVETERINARY CURRICULUM

Veterinary science department faculty serve as advisers to students enrolled in the preveterinary curriculum. Dr. E. W. Glazener, Director of Academic Affairs, serves as secretary of the N. C. Veterinary Certification Committee.

A preveterinary curriculum is offered under the science curriculum of Agriculture and Life Sciences as part of the North Carolina Veterinary Medical Education Program. After satisfactory completion of the preveterinary curriculum, North Carolina resident students are certified as eligible to seek admission to Auburn University, the University of Georgia, Ohio State University, Oklahoma State University, Tuskegee Institute and other colleges of veterinary medicine in which the State may enter into agreements through the Southern Regional Education Board or other contracts for veterinary students to attend at in-state tuition rates.

Preveterinary students work toward a Bachelor of Science degree in a discipline of their choice while fulfilling requirements of the preveterinary program. If a student is accepted in a college of veterinary medicine before completion of his or her undergraduate degree, some course credits may be transferred from the veterinary program back to N. C. State and applied toward completion of the Bachelor of Science degree. Arrangements for this procedure should be made with degree-granting department prior to entering veterinary college.

The courses listed below are minimum requirements for all students applying for entrance into veterinary college under the Southern Regional Education Board contract. A grade of C or better on each course and an overall grade point average of 2.7 on required courses are minimum requirements for certification by the North Carolina Certification Committee.

Language
(11-14 credits) — *Credits*

ENG 111 Composition and Rhetoric 3
ENG 112 Composition and Reading 3
SP 231 Expository Speaking 3
Advised English Elective 0-3
BS 495 Special Topics in Biology 2

Social Sciences and Humanities
(12-15 credits)

PS 201 The American Governmental System 3
Advised 200-Level History Elective 3
Additional Group D Electives 6-9

Physical and Biological Sciences
(51 credits)

BS 100 General Biology 4
CH 101 General Chemistry I 4
CH 107 Principles of Chemistry 4
CH 221 Organic Chemistry I 4
CH 223 Organic Chemistry II 4
BCH 351 Elementary Biochemistry 3
BCH 352 Elementary Biochemistry Laboratory 1
GN 411 The Principles of Genetics 3
MA 111 Algebra and Trigonometry 4
MA 112 Analytic Geometry and Calculus A 4
MB 401 General Microbiology 4
PY 211 General Physics 4
PY 212 General Physics 4
ZO 323 Comparative Anatomy 4

Applied Science and Technology
(11 credits)

ANS 200 Introduction to Animal Science .. 4
ANS 204 Livestock Feeds and Feeding 3
or
ANS (NTR, PO) 415 Comparative Nutrition 3
PO 201 Poultry Science and Production ... 4

Preveterinary students should work closely with their advisers since these course requirements are subject to change at any time by contracting veterinary colleges.

CURRICULUM

There is no program leading to the Bachelor of Veterinary Science degree. Members of the veterinary science faculty serve as advisers to undergraduates enrolled in the preveterinary curriculum.

Presently there is also no graduate program leading to advanced degrees in veterinary science. Faculty members serve on graduate committees and act as major professors for students seeking graduate degrees in certain other disciplines.

Zoology

Gardner Hall

Professor D. E. Davis, *Head of the Department*

Professors: F. S. Barkalow Jr., R. Harkema, W. W. Hassler, J. E. Hobbie, C. F. Lytle, B. S. Martof, G. C. Miller, T. L. Quay, J. F. Roberts, D. E. Smith; *Adjunct Professors:* T. R. Rice, J. G. Vandenberg, P. N. Witt; *Professor Emeritus:* B. B. Brandt; *Associate Professors:* P. C. Bradbury, M. T. Huish (USDI); *Adjunct Associate Professor:* D. A. Wolfe; *Assistant Professors:* G. T. Barthalmus, P. D. Doerr, W. C. Grant, J. M. Miller, K. E. Muse, G. B. Pardue (USDI), G. G. Shaw, J. M. Whitsett II, T. G. Wolcott; *Adjunct Assistant Professors:* G. R. Huntsman, G. W. Thayer; *Instructor:* N. A. Mercando; *Associate Members of the Faculty:* B. J. Copeland (Botany, Sea Grant Program), D. S. Grosch, L. E. Mettler (Genetics); D. W. Hayne (Statistics)

The Department of Zoology provides undergraduate and graduate instruction in specialized biological sciences areas. Undergraduates study all levels of biological organization from the molecular to the community. Zoology majors are adequately prepared for graduate work in zoology and related fields of sciences. For graduate degrees, see pages 12-14. Participation in supervised programs of research is strongly encouraged. Basic training is also available for students planning to enter dentistry, medicine and veterinary medicine and allied health sciences, such as medical technology. Ecology is emphasized, including wildlife, fisheries, conservation, parasitology and marine science.

OPPORTUNITIES

Students may continue with graduate research work leading to advanced degrees in zoology and wildlife. However, numerous employment opportunities are available for Bachelor of Science graduates. Majors are qualified for positions in the medical sciences, various government agencies and private industries.

UNDERGRADUATE CURRICULA

The Bachelor of Science degree with a major in zoology, wildlife biology or medical technology is offered under the science curriculum of the School of Agriculture and Life Sciences. Within these majors a student may specialize depending upon interest and ability.

The zoology sequence prepares students for graduate school while the premedical, predental and preveterinary options prepare students for entrance into these respective professional schools. Certain professional schools have specific requirements which differ slightly from the zoology curriculum. Students should consult catalogs of specific professional schools to ensure completion of any special requirements.

Other options include the fisheries and marine science program and the medical technology program outlined below. The clinical year for the medical technology program is taken at an affiliated hospital. Students are advised, especially in their junior and senior years, by faculty in their specialty.

Basic requirements are listed in the science curriculum on page 48.

TYPICAL CURRICULUM IN ZOOLOGY

SCIENCE PROGRAM

For the freshman year see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 103 General Chemistry II		CH 221 Organic Chemistry I	4
or		or	
CH 107 Principles of Chemistry	4	CH 220 Introductory Organic Chemistry*	4
Language Elective	3	Language Elective	3
Social Science and Humanities Elective	3	Social Science and Humanities Elective	3
Group A Elective	3	ZO 203 Vertebrate Zoology	4
ZO 202 Invertebrate Zoology	4	or	
Physical Education	1	ZO 323 Comparative Anatomy	
	18	Physical Education	1
			15

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 223 Organic Chemistry II	4	PY 212 General Physics	4
or		Social Science and Humanities Elective	3
BCH 351 Elementary Biochemistry*	3	**ZO 361 Vertebrate Embryology	4
PY 211 General Physics	4	**ZO (BO) 360 Introduction to Ecology	4
Social Science and Humanities Elective	3	Elective	3
Advised Elective	4		18
	14 or 15		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
GN 411 The Principles of Genetics	3	Advised Electives	15
**GN 412 Elementary Genetics Lab.	1		15
Social Science and Humanities Elect.	3		
**ZO (BO) 414 Cell Biology	3	Total Hours for Graduation	130
or			
ZO 421 Vertebrate Physiology	3		
**ZO 415 Cellular & Animal Physiology Laboratory	2		
Electives	6		
	18		

* Introductory Organic Chemistry, CH 220, and Elementary Biochemistry, BCH 351, may be used as alternates to CH 221, 223.
** Suggested departmental electives.

TYPICAL CURRICULUM IN WILDLIFE BIOLOGY

SCIENCE PROGRAM

For the freshman year see page 47.

For the sophomore year see the typical curriculum in zoology, page 85. (Take CH 103; CH 220.)

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BO 200 Plant Life	4	Botany Elective	4
PY 221 College Physics	5	*ENT (BS) 410 Biology of Insects	3
Social Science and Humanities Elective	3	Social Science and Humanities Elective	6
BCH 351 Elementary Biochemistry	3		17
ZO 221 Conservation of Natural Resources	3		
	18		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
*ZO (BO) 360 Introduction to Ecology	4	*GN 411 The Principles of Genetics	3
*ZO 415 Cellular & Animal Physiology		*ST 311 Introduction to Statistics	3

	Laboratory	2
*ZO 420	Fishery Science	3
ZO 421	Vertebrate Physiology	3
ZO 553	Principles of Wildlife Science	3
	Electives	3
		18
	Electives	10
		16
	Total Hours for Graduation	130

* Suggested departmental electives.

TYPICAL CURRICULUM IN MEDICAL TECHNOLOGY

SCIENCE PROGRAM

Two programs are available in medical technology. The first is a four-year collegiate curriculum with a Bachelor of Science degree in zoology (see above) followed by a year of training in any hospital clinical laboratory approved by the American Medical Association. The second program is designed to be completed in four calendar years. The student takes the prescribed curriculum for three years at North Carolina State University and a fourth year (12 months) of clinical training at an affiliated hospital. Successful completion of this program qualifies the student for a Bachelor of Science degree in medical technology from N. C. State. Acceptance by the clinical laboratory is competitive and students in either program outlined above must apply for clinical training. After completion of either program the student is eligible to take the national examination of the Board of Registry of Medical Technologists.

For the freshman year see page 47.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 107 Principles of Chemistry	4	Language or English Elective	3
Language or English Elective	3	CH 315 Quantitative Analysis	4
Social Science and Humanities Elective	3	PY 221 College Physics	5
ZO 201 Animal Life	4	Social Science and Humanities Elective	3
Elective	3	Physical Education	1
Physical Education	1		16
	18		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I or CH 220 Introductory Organic Chemistry	4	CH 223 Organic Chemistry II or BCH 351 Biochemistry	3
Social Science and Humanities Elective	3	Social Science and Humanities Elective	6
Advised Elective	3	ZO 421 Vertebrate Physiology or ZO (BO) 414 Cell Biology	3
ZO 212 Basic Anatomy and Physiology or ZO 323 Comparative Anatomy	4	ZO 415 Cellular & Animal Physiology Laboratory	2
Elective	4	MB 401 General Microbiology	4
	18		18-19
		Credit Hours Through Junior Year	100

SENIOR YEAR

A 12-month course in medical technology is to be taken at an affiliated hospital clinical laboratory.

	Hours		
Microbiology	10.0	Chemistry	8.5
Bacteriology		Nuclear Medicine	1.5
Mycobacteriology		Hematology	7.5
Mycology			
Parasitology			

Urinalysis	2.5	Histology	1.5
Blood Bank	3.5	Coagulation	1.5
Serology	3.5		40.0

For curricula in conservation see pages 62-63.

OPTIONS IN ZOOLOGY CURRICULUM

Students desiring to emphasize certain areas within zoology may choose an option:

PREMEDICAL OR PREDENTAL CURRICULUM IN ZOOLOGY

SCIENCE PROGRAM

General Physics	8	Organic Chemistry I, II	8
Comparative Anatomy	4	Quantitative Analysis	4
Genetics	4	Embryology	4
Physiology	5-8	Total Hours for Graduation	130

FISHERIES AND MARINE SCIENCE OPTION IN ZOOLOGY

SCIENCE PROGRAM

Physiology	5	Fishery Science	3
Limnology	4	Economic Insects	3
Ecology	4	Advised Electives	4
Ichthyology	4	Total Hours for Graduation	130

Agricultural Institute

Patterson Hall

J. E. Legates, *Dean of Agriculture and Life Sciences*

E. W. Glazener, *Associate Dean and Director of Academic Affairs*

H. B. Craig, *Associate Director of Academic Affairs and Director of the Agricultural Institute*

The Agricultural Institute is a two-year, terminal academic program which provides training in agriculture and related areas. It is part of Agriculture and Life Sciences at North Carolina State University. This program was begun in 1959 and was funded by legislative appropriation.

Its objective is to train those desiring a comprehensive education in agriculture and agribusiness.

Individuals with Institute training command attractive salaries, assume a more prominent role of leadership and become a distinct asset to various segments of agricultural society. They make significant contributions to their community, state and nation by being involved in the world's most vital industry.

The instructional programs are organized and conducted as a part of the over-all resident instruction program for Agriculture and Life Sciences. The Institute is an addition to and not a substitute for, the School's regular degree granting program. However, the faculty in residence for the four-year programs are responsible for organizing and teaching courses offered by the Institute.

People with training similar to that of the Institute are in demand by agricultural industries. As demand changes, courses will be evaluated and alterations will be made accordingly. Such a re-evaluation also aids the technical manpower needs of agricultural industry.

OPPORTUNITIES

Rapid technical advancement has been important in changing agriculture from a small production industry to the nation's largest industry. Closely associated with production agriculture are those areas related to recreation and beautification such as turfgrass management, flowers and ornamental plants. Increased production and consumer demand for convenience type foods have stimulated the food processing industry, in turn increasing food distribution requirements.

Today's complex agriculture requires a larger work force. This work force must be able to deal with a vast array of problems and opportunities and Institute graduates can assume responsible positions in the total agricultural industry. Some career examples are: farm and herd managers, research technicians, salesmen, retail farm supply and equipment outlet managers, golf course superintendents, nursery managers, agricultural pest control specialists, quality control technicians, food service supervisors and others. More job opportunities than graduates make salaries attractive.

The School maintains a Placement Office to assist graduates in finding employment.

ENTRANCE REQUIREMENTS

Any individual who has received a diploma from an accredited high school or has passed the high school equivalency examination administered by the State Department of Public Instruction is eligible for admission consideration. Each application will be reviewed and evaluated by the Institute director.

For additional information write: Director, Agricultural Institute, 107 Patterson Hall, Raleigh, N. C. 27607.

PROGRAMS OF STUDY

Graduates of the Agricultural Institute are awarded the Associate in Applied Agriculture degree. The 10 programs of study are: Agricultural Equipment Technology; Agricultural Pest Control; Field Crops Technology; Flower and Nursery Crops Technology; Food Processing, Distribution and Service; General Agriculture; Livestock Management and Technology (animal husbandry option and dairy husbandry option); Soil Management; and Turfgrass Management.

DESIGN

Brooks Hall

C. E. McKinney, *Dean*

H. K. Zschau, *Librarian*

The School of Design in its brief history since 1948, has established a role as an innovative educational institution in broad fields of design. While the designer's traditional role is understood, that of giving meaningful form to the environment, the School gives attention to the larger responsibility of design, the art of humanizing the environment. The context in which the designer works involves issues that are social, economic, political, and behavioral. The designer must be capable of engaging these issues as well as mastering the issues that are internal to a particular design discipline. The School seeks to develop the designer's perception, knowledge, skills, and analytical and problem-solving abilities. While the School cultivates the integrity of the individual, it emphasizes individual creative expression, and it encourages the student to develop a capability and temperament for teamwork.

The School of Design is intended to act as an educational center which unifies the different design professions in the fundamental knowledge and methods which they share; its further intention is the education of designers who will be competent within the specific demands and limitations of a particular field of design.

In all of the professional fields where studies are now established in the School, the methods and values which are common to all designers are separated only by the study of the application of the work in a single profession. Many classes throughout the curricula will include students in these professional fields, and for all students the course of study is similar during the first two years in order that, having become more familiar with the whole scope of activity in design, they may then select the design profession in which they are most interested. From one's first day in class to one's last, the student is asked to design and is counseled to become a responsible designer in the broadest sense.

CURRICULA AND DEGREES

The School of Design offers undergraduate instruction in architecture, landscape architecture, and product design with a visual design option, leading to a Bachelor of Environmental Design degree.

Graduate studies are also offered in four distinct fields—architecture, urban design, landscape architecture, and product design. See the Graduate Catalog for information on the masters programs.

The Common Foundation In Basic Design

Professor D. R. Stuart, *Program Director*

Professor: J. H. Cox; *Associate Professors:* G. L. Bireline Jr., F. Eichenberger, R. W. Musselwhite

The Basic Design Program has its foundation in the student's utilization of previous development. This program offers the learner a range of diverse experiences gained through active participation in the academic community as a whole, as well as those courses offered within the School of Design. The student achieves, through the development of physical form, an expression of the complex values and meanings of our society.

BASIC DESIGN CURRICULUM

FIRST YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
DN 101 Environmental Design I	3	DN 102 Environmental Design II	3
DN 111 Perception and Communication I	3	DN 112 Perception and Communication II	3
DN 121 History of Design I	3	DN 122 History of Design II	3
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
Mathematics*	3 or 4	Mathematics*	3 or 4
Physical Education	1	Physical Education	1
	16 or 17		16 or 17

SECOND YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
DN 201 Environmental Design III	4	DN 202 Environmental Design IV	4
DN 211 Visual Communication I	2	DN 212 Visual Communication II	2
Required Science Elective**	4	Required Science Elective**	4
Electives***	6	Electives***	6
Physical Education	1	Physical Education	1
	17		17

* Excluding credit for MA 111, must include one calculus course.

** Selected from natural, physical or biological sciences, but not to include math or computer science.

*** Thirty-six credit hours of electives which will be divided into three equal groups of 12 hours each:

a. Social science/humanities group.

b. Advised group—selected by student with adviser's approval to develop an area of concentration outside his major.

c. Unrestricted group.

Architecture

Brooks Hall

Dean C. E. McKinney, *Acting Program Director*

Professors: R. P. Burns Jr., H. Sanoff, V. Shogren; *Professors Emeritus:* H. H. Harris, H. L. Kamphoefner; *Associate Professors:* P. Batchelor, R. H. Clark, G. J. P. Reuer; *Assistant Professors:* A. J. Aho, D. W. Barnes Jr., E. P. Brantly, S. Kanda, E. W. Taylor

Architecture finds itself at a critical stage in its historical development. The architect's traditional problem of giving meaningful form to man's physical environment remains his chief concern, but this task has been vastly complicated by the forces of accelerating world urbanization and the technological revolution which is rapidly altering every facet of contemporary life. Social upheaval in the cities, ruthless violation of our landscape and natural resources, congestion and decay of our urban centers, obsolescence and inefficiency at every level of our transportation systems, the tendency toward giantism and anonymity in all of man's institutions—these are but a few elements in the complex condition of modern society with which the architect is confronted. The Architecture program attempts to prepare individuals with an understanding of man and his cultural context, with a commitment to the ordering of the physical environment, and with the tools for accomplishing these objectives.

The curriculum in architecture, while providing a broad basic structure common to all students, encourages individual diversity through a major elective program of in-depth study in one of several design-related fields leading to expanded background in social and cultural factors, programming and analytic methods, technological issues, urban affairs, visual studies, management and operations, economics or natural systems. Through interdisciplinary studies in the School and University and through the use of outside consultants, the interdependence of the architect with related professionals is strongly emphasized. The design studio is a

working laboratory in which analysis and synthesis become real and meaningful activities to the students.

Considering the changing requirements in the field of architecture and the increasing complexity of tasks facing today's architect, a six-year, two-degree curriculum has been established with studies organized into two-year cycles. See page 90 for the introductory two-year program. The junior and senior years mark the formal introduction to architectural studies and leads to the nonprofessional degree of Bachelor of Environmental Design. See the Graduate Catalog for information on the masters program.

For students not advancing to graduate studies, the four-year undergraduate curriculum is designed as a terminal program qualifying graduates to enter architecture at an intermediate level or related fields outside of architecture.

OPPORTUNITIES

The growth in urban development, with resulting building construction, affords many opportunities for design practice in private architectural offices. State law now requires the graduate architect to work not less than three years in the offices of registered architects and then to pass a written examination given by the North Carolina Board of Architecture before individual professional practice is permitted. The architecture graduate is also qualified for positions in public agencies, development organizations, building research, and teaching.

ARCHITECTURE CURRICULUM

See page 90 for first and second year curriculum.

THIRD AND FOURTH YEARS

		Credits		
ARC 400	Intermediate Architectural Design (Series)*	16	Professional Options**	10
Structures		12	Electives***	24
				62

Total Hours for the Bachelor of Environmental Design in Architecture — 129

* Four semesters at four credit hours per semester required in ARC 400 or equivalent.

** To be selected from professional options offered in the School of Design or other equivalent courses offered in the University. Must include ARC 331, 332.

*** Thirty-six credit hours of electives which will be divided into three equal groups of 12 hours each:

a. Social science/humanities group.

b. Advised group — selected by student with adviser's approval to develop an area of concentration outside his major.

c. Unrestricted group.

Landscape Architecture

Brooks Hall

Professor R. R. Wilkinson, *Program Director*

Professor Emeritus: E. G. Thurlow; *Associate Professor:* R. T. Hester Jr.; *Assistant Professors:* G. F. Gumz, J. Randle; *Associate Member of the Department:* T. O. Perry

Landscape Architecture is the profession concerned with design and development of man-made features on the land and enhancement of the visual landscape. There are approximately 8,000 practicing landscape architects in the United States whose activities range from site planning for urban complexes, community design, park and open space design, campus planning, and development of regional land management systems. The U. S. Forest Service, National Park Service, city planning, state and local parks agencies, and private design offices are major employment sources.

Types of work range from program development studies to detailed projects.

The Landscape Architecture faculty is concerned with preparing students for professional careers. In addition, the faculty is committed to establishing a strong educational and intellectual base for each student so that he may continue to learn and grow throughout his life.

OPPORTUNITIES

Graduates of the program gain employment with private offices practicing all phases of landscape architecture. Others seek employment with public agencies such as state park departments, community planning offices, and environmental protection agencies. Over the past several years, there have been at least five opportunities for each graduate. Many stay in North Carolina and participate in the rapid expansion of the profession and its involvement in the development of the State.

LANDSCAPE ARCHITECTURE CURRICULUM

See page 90 for first and second year curriculum.

THIRD AND FOURTH YEARS

	Credits		
LAR 400 Intermediate Landscape Architectural Design (Series)	16	Path Electives	12
Land Technology—LAR 410, 411, 412 + 3 additional credits	12	Social Sciences and Humanities (in addition to DN 121 & 122)	6
Professional Options*	10	Free Electives	6
			62

Total Hours for the Bachelor of Environmental Design in Landscape Architecture— 129

* Professional options to be selected from professional options in the School of Design or other equivalent courses within the University and to include ARC 441, Design Methods.

Product Design

Brooks Hall

Associate Professor V. M. Foote, *Program Director*

Associate Professors: D. A. Masterton, T. Takano; *Assistant Professor:* A. V. Cooke

Upon completion of the basic design requirements, the student selecting the product design program must elect as a major area of concentration the product or visual design option. The product or industrial design option is concerned with all the human aspects of machine-made products and their relationship to the environment. The designer is responsible for the product's human engineering, safety, shape, color, texture, maintenance, and cost. Product design or industrial design deals with consumer products as well as industrial products. In order to achieve these ends, it is necessary for the designer to involve himself in three major design and research activities: 1) Man's behavior; 2) The man-product-machine relationship; 3) The product itself.

Some areas of investigation include furniture, housewares, appliances, transportation, machine tools, farm equipment, medical electronic instruments, and recreational support equipment.

OPPORTUNITIES

The product designer has three choices for employment: a manufacturing company, an independent design office, or a governmental agency.

PRODUCT DESIGN CURRICULUM

See page 90 for first and second year curriculum.

THIRD AND FOURTH YEARS

	Credits		
PD 400	Intermediate Product Design (Series)* 16	Professional Options***	16
Product Design Technology**	6	Electives****	24
			62

Total Hours for the Bachelor of Environmental Design in Product Design — 129

* Four semesters at four credit hours per semester required in PD 400 or equivalent.
** To be elected from departmental offerings or equivalent courses within the University.
*** To be selected from professional options offered in the School of Design or appropriate courses offered in the University. Must include four semesters of PD 490, Intermediate Special Projects (Series), as well as PD 421, 422, and 431.
**** Thirty-six credit hours of electives which will be divided into three equal groups of 12 hours each:
a. Social science/humanities group.
b. Advised group of electives selected by student with adviser's approval to develop an area of concentration outside his major.
c. Unrestricted group.

VISUAL DESIGN OPTION

The new science of communication media has created a demand for people with operational knowledge of the various forms of visual communication. One set of these demands has to do with people able to carry out activities which have come to be known as visual design.

The history of visual design is one of separate skills and crafts which have now merged into a cohesive field of study. Such activities are:

a. Book, pamphlet, and brochure design (publishing, typography, printing, etc.).
b. Package design.
c. Signing and symbol creation (indesical and iconic indications).
d. Advertising design (newspapers, magazines, cinema, TV).
e. Education and commercial exhibition and display design.
f. Photography.
g. Development of techniques for analyzing visual character and its relation to social and behavioral functions in the urban environment.
h. Problem-solving approaches; exploration of visual means for solving socially defined problems.

Working through a broad range of visual creative experience, the student will develop an understanding of elements and principles of visual organization common to all visual communication. Upon receiving his undergraduate degree the student would be prepared to enter the professional field or be in a position to enter graduate schools for continued study in specific areas.

OPPORTUNITIES

The Visual Design option leads to varied careers, including the design of packaging, displays, exhibition, and products of presentation and communication.

VISUAL DESIGN OPTION CURRICULUM

See page 90 for first and second year curriculum.

THIRD AND FOURTH YEARS

	Credits		
PD 440	Intermediate Visual Design (Series)*	Professional Options***	16
	16	Electives****	24
Product Design Technology**	6		62

Total Hours for the Bachelor of Environmental Design in Product Design with Visual Design Option — 129

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* Four semesters at four credit hours per semester required in PD 440 or equivalent.

** To be elected from departmental offerings or equivalent courses within the University.

*** To be selected from professional options offered in the School of Design or appropriate courses offered in the University. Must include four semesters of PD 490, Intermediate Special Projects Series, as well as PD 421, 422, and 431.

**** Thirty-six credit hours of electives which will be divided into three equal groups of 12 hours each:

a. Social science/humanities group.
b. Advised group of electives selected by student with adviser's approval to develop an area of concentration outside his major.
c. Unrestricted group.

EDUCATION

Poe Hall

C. J. Dolce, *Dean*

W. Maxwell Jr., *Associate Dean*

The School of Education is concerned with the problems of human development from both the psychological and educational perspectives. With emphases upon the preparation of secondary and post secondary school teachers, counsellors and administrators, and psychologists, the school seeks students who are dedicated to the improvement of mankind through education and service and who are sensitive to the complexity of the teaching/learning processes.

The School is composed of the Division of Education; Departments of Adult and Community College Education, Agricultural Education, Industrial and Technical Education, Mathematics and Science Education, Guidance and Personnel Services and Psychology; the Industrial Arts section; and the Division of Occupational Education. The School also houses a major national research center: the Center for Occupational Education.

Undergraduate degree programs are offered in agricultural education, industrial arts education, vocational industrial education, technical education, mathematics education, secondary education, science education and psychology.

Graduate degree programs are offered in adult and community college education, agricultural education, curriculum and instruction, educational administration and supervision, guidance and personnel services, industrial arts education, mathematics education, occupational education, psychology, science education, special education, vocational industrial education.

Graduates of the undergraduate programs in education receive a Bachelor of Science degree in education and normally qualify for a Grade "A" Certificate to teach in their chosen fields. Graduates of the undergraduate program in psychology receive a Bachelor of Arts in psychology degree. Graduate programs confer the Master of Science or Master of Education degrees, and the Doctor of Philosophy or Doctor of Education degrees.

Professional education courses are provided for those students enrolled in the School of Liberal Arts who wish to become teachers of English, social studies, modern foreign languages, and speech communication. Students enrolled in Agriculture and Life Sciences and the sciences or mathematics departments may double-major in the School of Education toward obtaining the North Carolina teacher's certificate.

The modern School of Education building includes a curriculum materials center, industrial arts laboratories, science laboratories, psychology laboratories, as well as the latest developments in teaching technology. A computer facility, an instructional materials production center, child play and observation rooms, guidance and testing laboratories, and an adult learning laboratory are in Poe Hall.

Adult and Community College Education

(Also see Agriculture and Life Sciences.)

Poe Hall and Ricks Hall

Professor E. J. Boone, *Head of the Department*

TEACHING, RESEARCH AND EXTENSION

Professors: M. Burt, M. Knowles, C. Trent; *Extension Professor:* J. D. George; *Adjunct Professor:* B. E. Fountain Jr.; *Associate Professors:* W. L. Carpenter,

W. L. Gragg, G. E. Parsons, R. W. Shearon; *Extension Associate Professors:* C. Black, M. Brown, E. E. White; *Assistant Professors:* J. C. Glass Jr., K. B. Segner III; *Extension Assistant Professor:* D. M. Jenkins; *Adjunct Assistant Professor:* C. J. Law Jr.

The adult and community college education faculty offers instruction at advanced undergraduate and graduate levels. Advanced undergraduate courses are designed to support other departments of the institution, giving students a background in adult and community college education. The department does not have a program leading to a bachelor's degree.

The graduate program is designed to increase the professional competence of adult and community college educators in developing and administering adult and community college education programs and in conducting scholarly research in the field. For graduate degrees, see pages 12-14 and the Graduate Catalog.

Agricultural Education

Poe Hall

Professor: J. K. Coster; *Professor Emeritus:* J. B. Kirkland; *Associate Professors:* C. D. Bryant, T. R. Miller

Agricultural education, in its broadest sense, encompasses areas of study which will enable one to participate effectively in planning, promoting and initiating programs in education in agriculture.

The department offers a program leading to a Bachelor of Science degree. Programs are designed for the teachers of vocational agriculture in the secondary schools, technical institutes and community colleges. For details of the master's degree programs (for degrees offered, see pages 12-14) consult the Graduate Catalog.

OPPORTUNITIES

The demand for agricultural education teachers exceeds present supply. Graduates who obtain certification in the Bachelor's degree program generally have a choice of positions in the Carolinas and Virginia and throughout the nation.

AGRICULTURAL EDUCATION CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 111 Algebra and Trigonometry	4	Mathematics Elective	3
BS 100 General Biology	4	Poultry Science or Animal Science Elective	4
Plant Science Elective*	3-4	History Elective	3
ED 102 Objectives in Agricultural Education	1	Agricultural Elective	3-4
Physical Education	1	Physical Education	1
	16-17		17-18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EC 201 Economics I	3	EC 212 Economics of Agriculture	3
CH 101 General Chemistry I	4	CH 103 General Chemistry II	4
BAE 211 Farm Machinery	4	ED 313 Contemporary Vocational Agriculture	3
Agricultural Elective	3-4	Agricultural Specialty***	3-4
Physical Education	1	Physical Education	1
	15-16		14-15

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ED 344 School and Society	3	SSC 200 Soil Science	4
SOC 202 Principles of Sociology	3	Literature Elective	3
PSY 376 Human Growth and Development	3	PSY 304 Educational Psychology	3
Free Elective	3	Agricultural Specialty***	3-4
"A" Elective in Agriculture**	3-4	Speech Elective	3
		ED 490 Senior Seminar in Agricultural Education	1
	15-16		17-18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ED 411 Student Teaching in Agriculture	8	Humanity Electives****	6
ED 412 Teaching Adults	2	Agricultural Specialty***	3
ED 413 Planning Educational Programs	2	Political Science Elective	3
SOC 416 Research Methods	3	Free Electives	6
	15		18

Minimum Hours Required for Graduation 127

* Includes courses in crop science, horticulture or forestry.
** Course to be selected from "A" elective in agriculture in area of specialization.
*** Courses to be in specialty area of at least 12 semester hours.
**** Humanities electives from philosophy, religion, art or music.

Curriculum and Instruction

Curriculum and Instruction is a graduate program designed to prepare directors of instruction/curriculum-specialists and researchers in curriculum development and in the teaching/learning processes relating to the student's teaching field. For a list of graduate degrees see pages 12-14 and consult the Graduate Catalog.

Division of Education

Associate Professor B. M. Parramore, *Program Coordinator*

Adjunct Professor: T. L. Roundtree; *Associate Professors:* L. J. Betts, S. D. Ivie, P. J. Rust, T. N. Walters; *Assistant Professors:* C. W. Harper Jr., H. E. Munn Jr.; *Teaching Technician:* J. R. Gibson

The Division of Education offers foundation and general education courses required by all teacher education programs. The Division of Education also offers the general Secondary Education degree which is described below.

SECONDARY EDUCATION

The program in Secondary Education is designed to fulfill several objectives: Newly admitted students, who are undecided as to which particular professional teacher preparation program they wish to enroll in, are able to select the secondary education program until they have decided upon a particular curriculum. Students who do not desire to teach, but who are interested in education as a field of study enroll in this option. Students who wish to prepare for teaching in newly developing fields for which no teacher preparation programs have been developed may also select this program. Those students interested in preparing to be teachers of

English, Spanish, French, speech communication and social studies who wish a degree in education may enroll in the secondary education program.

The basic curriculum provides a relatively large number of free electives. This allows for the development of a particular specialty in depth, depending upon the student interests. Students in English, social studies, Spanish, French and speech communication education follow basically the same programs of study as those enrolled in the School of Liberal Arts.

OPPORTUNITIES

Students earning a degree in this program have, generally, the same options as graduates of related programs: teaching in secondary schools, graduate study, or employment in governmental and private agencies involved in formal or non-formal education.

SECONDARY EDUCATION CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 111 Algebra & Trigonometry	4	MA 112 Analytic Geometry and Calculus A	4
History	3	History	3
Social Science	3	Social Science	3
Physical Education	1	PSY 200 Introduction to Psychology	3
	14	Physical Education	1
			17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Literature	3	Literature	3
Natural Science	3-5	Natural Science	3-5
Speech	3	ED 205 Introduction to Teaching Humanities & Social Studies	3
PHI 205 Problems & Types of Philosophy	3	Electives	3
Social Science	3	Social Science	3
Physical Education	1	Physical Education	1
	16-18		16-18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 304 Educational Psychology	3	PSY 376 Human Growth and Development	3
ED 344 School & Society	3	ED (SOC) 318 Introduction to the Sociology of Education	3
Natural Science	3-5	Electives	6
Electives	3	Social Science	3
Social Science	3		15
	15-17		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 370 Psychology of Personality & Adjustment	3	ED 496 Senior Seminar in Education	3
ED 483 An Introduction to Instructional Media	3	ED 420 Principles of Guidance	3
ED (PHI) 304 Philosophy of Education	3	ED 440 Vocational Education	2
Electives	6	Electives	6
	15		14
		Total Hours Required for Graduation	124-128

Educational Administration and Supervision

Professor C. J. Dolce, *Program Coordinator*

Adjunct Professor: A. C. Phillips; *Associate Professor:* W. Maxwell; *Assistant Professor:* D. R. Kniefel

There is no undergraduate program in this field. Graduate programs are individually designed by the student in consultation with the program staff (for degrees, see pages 12-14). These programs prepare the student for a variety of administrative or supervisory or policy-making roles: school principal, superintendent, Federal or state agency associate, or work with private or public educational research or service organizations. For further information consult the Graduate Catalog.

Guidance and Personnel Services

Poe Hall

Professor W. E. Hopke, *Head of the Department*

Professor Emeritus: C. G. Morehead; *Associate Professor:* B. C. Talley Jr.; *Assistant Professors:* L. K. Jones, J. G. McVay; *Adjunct Assistant Professors:* M. A. Connors, Jr., R. H. Massengill, C. L. Quinn

The department offers work leading to graduate degrees (see pages 12-14) with a major in guidance and personnel services (or counselor education). The degrees are designed to prepare individuals for guidance and personnel positions at various levels in elementary and secondary schools, junior and community colleges, trade and technical schools and institutes, and other institutions of higher education. For further information consult the Graduate Catalog.

Industrial Arts Education

Poe Hall

Associate Professor T. B. Young, *Program Coordinator*

Professors Emeriti: I. Hostetler, D. W. Olson; *Associate Professor:* G. E. Baker; *Assistant Professor:* R. T. Troxler

Industrial arts comprises that area of education which concerns itself with materials, processes and products of industry, including the graphical presentation of these. It is concerned with a study of changes made in materials to make them more useful and with problems related to these changes.

The industrial arts education curriculum performs the function of preparing teachers and supervisors of industrial arts for secondary schools.

OPPORTUNITIES

The graduates of the industrial arts program find opportunities for employment in the public schools. For graduate degrees offered see pages 12-14 and consult the Graduate Catalog.

INDUSTRIAL ARTS EDUCATION CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition and Rhetoric	3	ENG 112 Composition & Reading	3
IA 100 Introduction to Industrial Arts	1	IA 105 Drafting	4
IA 102 Fundamentals of Materials & Processes	4	MA 112 Analytic Geometry and Calculus A	4
MA 111 Algebra & Trigonometry	4	PS 201 The American Governmental System	3
Physical Education	1	Physical Education	1
	16		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	EC 201 Economics I	3
IA 209 Wood Processing	4	IA 210 Metal Technology	4
PY 211 General Physics	4	PY 212 General Physics	4
SOC 202 Principles of Sociology	3	Speech Elective	3
PSY 200 Introduction to Psychology	3	Elective*	3
Physical Education	1	Physical Education	1
	19		18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
IA 205 Industrial Arts Design	3	ED 344 School & Society	3
IA 312 Electricity-Electronics	4	ED 482 Curriculum Problems in Industrial Arts	2
IA 484 School Shop Planning and Equipment Selection	3	IA 304 General Shop Organization	2
PSY 304 Educational Psychology	3	IA 306 Graphic Arts	4
Electives*	6	IA 315 General Ceramics	3
	19	Literature Elective	3
			17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ED 420 Principles of Guidance	3	History Elective	3
ED 422 Methods of Teaching Industrial Subjects	3	IA 465 Independent Study in Industrial Arts	3
ED 444 Student Teaching in Industrial Subjects	8	IA 480 Modern Industries	3
ED 483 An Introduction to Instructional Media	3	Electives*	9
PSY 476 Adolescent Psychology	2		18
	19	Total Hours for Graduation	134

* To provide depth of experience in one or two areas of Industrial Arts, nine additional hours are required in one area and/or six additional hours in one and three in another.

Industrial and Technical Education

Poe Hall

Professor D. M. Hanson, *Head of the Department*

Professor Emeritus: J. T. Nerden; *Associate Professor:* F. S. Smith; *Assistant Professor:* T. C. Shore Jr.; *Instructor:* W. M. Parker

The Department of Industrial and Technical Education offers curricula to prepare teachers, supervisors and administrators for the public schools, area vocational schools, community colleges and technical institutes. Complete four-year curricula

in vocational industrial education and technical education lead to the Bachelor of Science in education. The curricula are planned to provide students with broad cultural and professional backgrounds to parallel occupational experience.

The department offers graduate degrees (see pages 12-14). For further information consult the Graduate Catalog.

VOCATIONAL INDUSTRIAL EDUCATION

The curriculum in vocational industrial education is designed to prepare vocational teachers for the secondary schools, area vocational schools and post-secondary school vocational programs. Upon satisfactory completion of the curriculum the graduate is qualified to teach in any of the aforementioned vocational areas.

OPPORTUNITIES

Graduates of the vocational industrial education curriculum have a wide selection of employment opportunities. The rapid growth of the vocational programs in the secondary schools in all fields has created an urgent demand for vocational teachers. A student may qualify for teaching positions in introduction to industrial education, trade preparatory training and industrial cooperative training in these fast-growing programs in the secondary schools. Other opportunities include teaching in the area vocational schools, in industry and in the post-secondary schools.

VOCATIONAL INDUSTRIAL EDUCATION CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ED 100 Introduction to Industrial Education	2	History Elective	3
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 111 Algebra & Trigonometry or	3-4	MA 122 Math of Finance & Elementary Statistics or Mathematics Elective	3-4
MA 115 Introduction to Contemporary Mathematics		Drafting Elective	3-4
CH 111 Foundations of Chemistry	4	Physical Education	1
Physical Education	1		14-15
	13-14		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PY 221 College Physics or Physics Elective	4-5	SOC 202 Principles of Sociology	3
Speech Elective	3	EC 201 Economics I	3
PS 201 The American Governmental System	3	ED 305 Analysis of Technical Education Programs & Course Construction	3
Physical Education	1	ED 327 History & Philosophy of Industrial and Technical Education	3
Electives	6	PE 280 Emergency Medical Care & First Aid	2
	17-18	Physical Education	1
		Elective	3
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ED 344 School & Society	3	PSY 376 Human Growth and Development	3
IE 355 Occupational Safety and Health	3	ED 428 Organization of Related Study Materials	3
ED 421 Principles and Practices in Industrial Cooperative Training or	3	or	
ED 405 Industrial and Technical Education Shop and Laboratory Planning	3	ED 405 Industrial and Technical Education Shop and Laboratory Planning	3

PSY 304	Educational Psychology	3
ED 420	Principles of Guidance	3
Elective		3
		18

ED 440	Vocational Education	2
ED 422	Methods of Teaching Industrial Subjects	3
ED 483	An Introduction to Instructional Media	3
Elective		4
		18

SENIOR YEAR

Fall Semester		*Credits*
ED 444	Student Teaching in Industrial Subjects	8
ED 457	Organization and Management of Youth Club Activities	3
ED 496	Senior Seminar in Education	3
		14

Spring Semester	*Credits*
Economics Elective	3
Sociology Elective	3
English Elective	3
Elective	6
	15
Hours Required for Graduation	128

Eighteen hours of electives must be selected in accordance with the student's area of specialization and with the approval of the adviser. Remaining hours may be taken from free electives.

TECHNICAL EDUCATION

The curriculum in technical education is oriented toward preparing instructors within a wide range of teaching technologies and is closely coordinated with existing engineering curricula. A student enrolling in the technical education curriculum may specialize to some extent in areas related to interest and/or previous work experience. Admission to the technical education curriculum is limited to students demonstrating proficiency in a given applied technology, i.e., electrical, electronics, mechanical, etc.

OPPORTUNITIES

Employment opportunities for technical education graduates include teaching in the expanding community college complex, technical institutes, area vocational schools and within industry as instructors and coordinators of training programs. The growth of technical education in the nation and the large number of new technical education facilities being constructed will require an increasing number of instructors to staff teaching positions.

TECHNICAL EDUCATION CURRICULUM*

FRESHMAN YEAR

Fall Semester		*Credits*
CH 101	General Chemistry I	4
ED 100	Introduction to Industrial Education	2
ENG 111	Composition and Rhetoric	3
MA 111	Algebra and Trigonometry	4
Physical Education		1
		14

Spring Semester		*Credits*
EC 201	Economics I	3
ENG 112	Composition and Reading	3
MA 102	Analytic Geometry and Calculus I	4
PS 201	The American Governmental System	3
Physical Education		1
		14

SOPHOMORE YEAR

Fall Semester		*Credits*
E 101	Engineering Graphics I	2
English Elective		3
MA 201	Analytic Geometry & Calculus II	4
PY 205	General Physics or	
PY 211	General Physics	4
Physical Education		1
		14

Spring Semester		*Credits*
PSY 200	Introduction to Psychology	3
PY 208	General Physics or	
PY 212	General Physics	4
Electives**		6
Physical Education		1
		14

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ED 327 History & Philosophy of Industrial & Technical Education	3	ED 305 Analysis of Technical Education Programs & Course Construction	3
PSY 304 Educational Psychology	3	SOC 401 Human Relations in Industrial Society	3
SOC 202 Principles of Sociology	3	Electives**	9
Electives**	6		15
	15		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ED 405 Industrial & Technical Education Shop and Laboratory Planning	3	ED 444 Student Teaching in Industrial Subjects	8
ED 422 Methods of Teaching Industrial Subjects	3	Electives**	7
Electives**	9		15
	15	Total Hours Required for Graduation	116

* Student will be expected to demonstrate proficiency in the applied technology of his choice—may be fulfilled by technical institute training or selected courses in addition to those required for the degree.

** Minimum of 27 hours of elective courses must be selected from engineering, engineering sciences, physical sciences, etc., in accordance with the students' area of specialization and with the approval of the adviser. Remaining hours may be taken from free electives.

Mathematics and Science Education

Poe Hall

Professor H. E. Speece, *Head of the Department*

Professors: N. D. Anderson, L. M. Clark; *Associate Professors:* J. R. Kolb, H. A. Shannon; *Assistant Professors:* W. M. Waters Jr., L. W. Watson; *Adjunct Assistant Professors:* E. G. Blakeway, R. R. Jones, C. M. Meek

The Department of Mathematics and Science Education offers a program for preparing undergraduate students as teachers of mathematics and science. The programs are designed to provide a broad background in the natural sciences, social sciences and humanities; depth in mathematics or an area of science; and the development of professional competencies needed by teachers entering the schools of today. The depth of preparation will enable students to pursue a program of graduate studies, see pages 12-14 and the Graduate Catalog.

OPPORTUNITIES

The demand for qualified mathematics and science teachers in our schools and colleges provides opportunities for mathematics and science education graduates. Developments in the schools and in our society accentuate the importance of preparation and competence in teaching, and this is reflected in increased salaries, opportunities for graduate study, and professional advancement.

MATHEMATICS EDUCATION CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
PHI 201 Logic	3	MA 201 Analytic Geometry & Calculus II	4
MA 122 Mathematics of Finance & Elementary Statistics	4	History Elective	3

MA 102	Analytic Geometry & Calculus I	4
	Physical Education	1
ED 101	Orientation	0
		15
	Humanities-Social Science Elective+	2-3
CSC 111	Algorithmic Language I	
	or	
CSC 101	Introduction to Programming	3
	Physical Education	1
		16-17

SOPHOMORE YEAR

Fall Semester		*Credits*
	Mathematics*	4
	Science**	4
	Speech Elective	3
	Literature Elective	3
	Humanities-Social Science Elective+	3
	Physical Education	1
		18

Spring Semester		*Credits*
	Mathematics*	3-4
	Science**	4
ST 371	Introduction to Probability & Statistics	4
ED 203	Introduction to Teaching Mathematics of Science	3
	Physical Education	1
		15-16

JUNIOR YEAR

Fall Semester		*Credits*
ED 101	Orientation	0
MA 403	Introduction to Modern Algebra	3
ED 344	School & Society	3
	Mathematics Elective	3
	Supporting Elective***	3
	Humanities-Social Science Elective+	3
		15

Spring Semester		*Credits*
ED 101	Orientation	0
MA 408	Foundations of Euclidean Geometry	3
PSY 304	Educational Psychology	3
MA 433	History of Mathematics	3
	Supporting Elective***	3
	Humanities-Social Science Elective+	3
	Elective	3
		18

SENIOR YEAR

Fall Semester		*Credits*
ED 496	Senior Seminar in Education++	1
ED 495	Senior Seminar in Mathematics & Science Education++	3
ED 470	Methods of Teaching Mathematics++	3
ED 471	Student Teaching in Mathematics++	8
ED 472	Developing & Selecting Teaching Materials in Mathematics++	2
		17

Spring Semester		*Credits*
	Mathematics Elective	3
	Supporting Elective***	3
	Humanities-Social Science Elective+	3
	Electives	6
		15
	Total Hours for Graduation	129

* One of these sequences can be followed: MA 231, 202; MA 202, 405.

** Science must be two-semester sequence in chemistry or physics.

*** Supporting electives must be an approved sequence in science, mathematics, computer science, statistics, economics, philosophy, history of science, sociology, or psychology.

\+ The humanities/social sciences electives must be chosen so that six hours are in humanities and nine hours are in the social sciences. Humanities include: philosophy, religion, literature, fine arts, history and foreign language. Social sciences include: economics, sociology, anthropology, political science, psychology and geography.

++ These courses are taken as a block in the professional semester.

SCIENCE EDUCATION CURRICULUM

FRESHMAN YEAR

Fall Semester		*Credits*
ENG 111	Composition and Rhetoric	3
MA 102	Analytic Geometry & Calculus I*	4
	or	
MA 112	Analytic Geometry & Calculus A	4

Spring Semester		*Credits*
ENG 112	Composition & Reading	3
MA 201	Analytic Geometry & Calculus II*	
	or	
MA 212	Analytic Geometry & Calculus B	3-4

CH 101 General Chemistry I	4
Humanities-Social Sciences**	3
Physical Education	1
ED 101 Orientation	0
	15

CH 103 General Chemistry II	4
or	
CH 107 Principles of Chemistry II*	4
Biological Science Elective	4
Physical Education	1
	16

SOPHOMORE YEAR

Fall Semester	*Credits*
PY 211 General Physics***	4
Speech Elective	3
Required Science	3
Elective	3
Physical Education	1
Humanities-Social Science**	3
	17

Spring Semester	*Credits*
PY 212 General Physics***	4
ED 203 Introduction to Teaching Mathematics and Science	3
Humanities & Social Science**	3
Physical Education	1
Required Science****	6
	17

JUNIOR YEAR

Fall Semester	*Credits*
PSY 304 Educational Psychology	3
Humanities-Social Science**	3
Required Science****	7
HI 321 Ancient & Medieval Science	3
or	
HI 322 Rise of Modern Science	3
or	
PHI 405 Philosophy of Science	3
	16

Spring Semester	*Credits*
ED 344 School & Society	3
Humanities-Social Science**	3
Required Science****	7
Elective	3
	16

SENIOR YEAR

Fall Semester	*Credits*
ED 475 Methods of Teaching Science*****	3
ED 476 Student Teaching in Science*****	8
ED 477 Instructional Materials in Science	2
ED 495 Senior Seminar in Mathematics and Science Education*****	3
ED 496 Senior Seminar in Education*****	1
	17

Spring Semester	*Credits*
Humanities-Social Science**	6
Elective	3
Required Science****	4
	13
Total Hours for Graduation	127

* Required of those specializing in chemistry or physics.

** To be selected as follows from the humanities and social sciences:
One course in history (3)
One course in literature (3)
Two additional courses from any of the following humanities:
fine arts, foreign language, history, literature, philosophy, religion (6)
Three courses from any of the following social sciences:
anthropology, economics, geography, political science, sociology, psychology (9)

*** Students may elect to take PY 205, PY 208 or PY 201, 202, 203 in lieu of PY 211, 212.

**** Students are required to take a minimum of 27 semester hours in one of four areas of specialization (biology, chemistry, physics or earth science).

***** These courses are taken as a block in the professional semester (offered fall semester only in science education).

SCIENCE EDUCATION SPECIALIZATION REQUIREMENTS (27 hours)

BIOLOGY SPECIALIZATION:

Survey of Plant Life (BO 200)	4
Survey of Animal Life (ZO 201)	4
Introductory Organic Chemistry (CH 220)	4
Genetics (GN 301 or GN 411, 412)	3-4
Ecology (BO/ZO 360)	4
General Microbiology (MB 401)	4
Plant Physiology (BO 421)	
or	
Vertebrate Physiology (ZO 421)	3-4
or	
Cell Biology (ZO/BO 414)	

CHEMISTRY SPECIALIZATION:

Organic Chemistry		4
Analytical Chemistry		4
Physical Chemistry		4
MA 202	Analytic Geometry & Calculus III	4
Earth Science Elective		3
Chemistry Electives		8

EARTH SCIENCE SPECIALIZATION:

GY 120	Physical Geology—GY 110 Physical Geology Laboratory	3
GY 222	Historical Geology	3
MY 201	Atmospheric Environment or	
MY 411	Introductory Meteorology	3
PY 223	Astronomy	3
OY (MAS) 200	Introduction to the Marine Environments	3
Earth Science Electives		12

PHYSICS SPECIALIZATION:

PY 223	Astronomy	3
PY 407	Introduction to Modern Physics or	
PY 203	General Physics	3-4
MA 202	Analytic Geometry & Calculus III	4
Earth Science Elective		3
Physics-Mathematics Electives		13-14

Occupational Education

Professor J. K. Coster, *Program Coordinator*

Assistant Professor: W. L. Cox; *Adjunct Professor:* B. E. Childers; *Adjunct Associate Professors:* W. J. Brown, J. R. Clary, C. H. Rogers

Occupational education involves a study of the occupational structure of society, manpower requirements and the functions of vocational education.

There is no undergraduate program in occupational education. However, undergraduate courses are offered which support vocational education programs. The Division of Occupational Education offers programs which lead to graduate degrees, see pages 12-14. For further information consult the Graduate Catalog.

Psychology

Poe Hall

Professor H. G. Miller, *Head of the Department*

Professors: H. M. Corter, D. W. Drewes, J. C. Johnson, S. E. Newman, R. G. Pearson; *Professor Emeritus:* K. L. Barkley; *Associate Professors:* J. L. Cole, J. W. Cunningham, T. E. LeVere, B. A. Norton, R. G. Rawls, J. L. Wasik, B. W. Westbrook; *Adjunct Associate Professor Emeritus:* J. W. Magill; *Adjunct Associate Professors:* R. W. Oppenheim, M. N. Wiebe; *Assistant Professors:* V. G. Cowgell, J. E. Luginbuhl, D. H. Mershon, F. J. Smith, L. S. Taylor; *Adjunct Assistant Professors:* B. C. Ball, B. F. Corder, L. D. Silber

Psychology is one of the basic university disciplines. Mastery of some of the knowledge in psychology is necessary to practitioners in education, health, social service, social sciences and managerial professions.

The undergraduate program in psychology consists of a general major and two optional programs—human resource development and experimental psychology. The general option is flexible and may be chosen by students who wish to prepare for entry into professional and graduate study. The program flexibility enables them to choose elective courses which prepare them for the graduate program of their interest. Human resource development is designed to educate students in specific psychology and human interaction skills which will qualify them to enter human development occupations upon graduation. The occupations may include corrections, mental health, education, etc. The experimental option emphasizes the development of competence in the use of the experimental method in accumulating scientific knowledge. In this option substantial work in physical science, biological science and mathematics is required.

The Psychology Department offers graduate programs, see pages 12-14. For further information see the Graduate Catalog.

OPPORTUNITY

Students holding the bachelor's degree in psychology and wishing to apply their psychological studies in a professional capacity generally continue their education in a graduate program such as clinical or experimental psychology or such fields as law, medicine, business, social work, and a variety of other fields. Students in psychology may also choose to enter business or government, often without further training beyond the bachelor's degree.

EXPERIMENTAL PSYCHOLOGY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 112 Analytic Geometry and Calculus A	4	MA 212 Analytic Geometry and Calculus B	3
BS 100 General Biology	4	PSY 200 Introduction to Psychology	3
English Composition	3	English Composition	3
Elective	3	PHI 205 Problems & Types of Philosophy	3
Physical Education	1	Elective	3
	15	Physical Education	1
			16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 114 Topics in Modern Mathematics	3	ST 311 Introduction to Statistics	3
English Literature	3	English Literature	3
History	3	History	3
PSY 300 Perception	3	PHI 201 Logic	3
CSC 101 Introduction to Programming	3	Social Science	3
Physical Education	1	Physical Education	1
	16		16

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 310 Learning & Motivation	3	PSY 320 Cognition Processes	3
PSY 400 Perception: Research Methods	3	PSY 420 Cognitive Processes: Research Methods	3
GN 411 The Principles of Genetics	3	Elective	3
Physical Science I	3-4	Physical Science II	3-4
Elective	3	Elective	3
	15-16		15-16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 410 Learning & Motivation: Research Methods	3	PSY 430 Neuropsychology: Research Methods	3
PHI 405 Philosophy of Science	3	PSY 505 History and Systems of Psychology	3
Social Science	3	Electives	9
Electives	6		15
	15		

Total Hours for Graduation 124

HUMAN RESOURCE DEVELOPMENT CURRICULUM

FRESHMAN YEAR

	Credits		
Mathematics	6	Biology	4
English Composition	6	Psychology 200	3
History	6	Physical Education	2
Sociology	3	Elective	3
			33

SOPHOMORE YEAR

	Credits
Natural Science	6-8
Statistics	3
Psychology & Social Science	9
Philosophy	3
English Literature	6
Elective	3
Physical Education	2
	32-34

JUNIOR YEAR

	Credits
Speech 231	3
Psychology 350	4
Psychology 351	4
Psychology 352	4
	15
Psychology 493	4
Psychology 495	8
	12
	27

SENIOR YEAR

	Credits
Psychology 491	3
Psychology 492	3
Philosophy	3
Electives	24
	33
Hours Required for Graduation	125

PSYCHOLOGY: GENERAL CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Mathematics	3-4	Mathematics	3-4
English Composition	3	English Composition	3
Biological Science	4	PSY 200 Introduction to Psychology	3
Elective	3	Philosophy	3
Physical Education	1	Elective	3
	14-15	Physical Education	1
			16-17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 210 Psychological Analysis Applied to Current Problems	3	PSY 300 Perception	3
Natural Science	3-4	Natural Science	3-4
History	3	History	3
Sociology	3	Statistics	3
Psychology Elective	3	Psychology Elective	3
Physical Education	1	Physical Education	1
	16-17		16-17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 310 Learning & Motivation	3	PSY 320 Cognitive Planning	3
Literature	3	Literature	3
Social Science	3	Social Science	3
*Electives	6	*Electives	6
	15		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 491 Seminar in Psychology	3	PSY 492 Seminar in Psychology	3
Philosophy	3	Elective	3
Social Science	3	*Electives	9
*Electives	6		15
	15	Total Hours for Graduation	124

* Advised Electives

Secondary Education

(See Division of Education, page 97.)

Special Education

Assistant Professor K. A. McCutchen, *Program Coordinator*

Adjunct Associate Professor: H. G. Royall Jr.

The program in special education is designed for educators who wish to pursue advanced study relating to the learning problems and the education of children and youth. This program offers a general background in all areas of exceptionality, intellectual, physical and emotional, with specialization in mental retardation and sensory impairment. There is no undergraduate program in this field at North Carolina State University, but graduate degrees are offered, see pages 12-14. For further information consult the Graduate Catalog.

Science education seniors perfect their skills in teaching methods prior to eight weeks of student teaching.

Measurement of the diameter of a tree helps determine growth and the amount of timber in a tract.

ENGINEERING

Riddick Hall

R. E. Fadum, *Dean*

R. G. Carson Jr., *Associate Dean for Academic Affairs*

H. B. Smith, *Associate Dean for Research and Graduate Studies*

J. R. Canada, *Associate Dean for Extension*

The engineer has the responsibility and obligation to use knowledge in his field for the benefit of mankind. Today, a new sense of responsibility has been imposed upon the engineer because of the impact of science and technology.

Engineering studies are important to those young men and women who look to industry, engineering education, or research and development for a career. These ambitions can well be furthered by the School of Engineering through its undergraduate or graduate programs, where students are offered technical instruction and leadership guidance by an experienced staff of qualified engineering educators.

The School of Engineering is organized into nine departments: biological and agricultural, chemical, civil, electrical, engineering science and mechanics, industrial, materials, mechanical and aerospace, and nuclear. Undergraduate degree programs are offered in all departments listed. In addition, a degree in engineering operations is offered through a curriculum coordinator. Most teaching departments offer advanced studies leading to the professional degree, the master's degree and the Doctor of Philosophy degree. See pages 12-14 for a complete list.

A career guidance and placement office is maintained by the University to assist graduating students and alumni.

The School of Engineering's curricula more than meets the standards of the Engineers' Council for Professional Development. It is the ambition of the school that these curricula and programs meet the needs of the people and industries of the state and region through effective instruction, competent research and development and worthwhile contributions to engineering knowledge.

CURRICULA AND DEGREES

The freshman year is the same in all engineering curricula. Entering students are assigned to the Freshman Engineering and Student Services Division where each student is given advice in planning an appropriate program of study. Although the entering student may indicate a curriculum choice, he or she may wait until the end of the first year when one is in a better position to judge which engineering branch of study is most suited to one's own interests and talents.

Bachelor of Science in Engineering—The four-year program provides preparation for graduate school or to meet the needs of young people who will go into industry in the fields of design, development, production, sales, application, and planning and operation of industrial units.

The four-year curricula offer programs of study leading to a bachelor's degree in aerospace, biological and agricultural, chemical, civil, electrical, engineering science and mechanics, engineering operations, industrial, materials, mechanical and nuclear engineering. Construction engineering is an option in civil engineering. Graduation requirements are the satisfactory completion of the electives and required courses in any one curriculum which amount to 125 to 130 semester hours. A minimum scholastic record of a "C" average is also required.

Specialized Degree—A specialized Bachelor of Science degree is offered through a program of study in furniture manufacturing and management. This four-year curriculum is offered through the Department of Industrial Engineering.

Joint Liberal Arts-Engineering Program—Students may wish to combine a Bachelor of Science in Engineering with either a Bachelor of Science or Bachelor of Arts in Liberal Arts. When the two are carried along together, the double degree program can be completed in five years. Those interested should contact the Freshman Engineering and Student Services Division and the Dean of Liberal Arts.

Professional Degree in a Specialized Branch of Engineering—The professional degree in a specialized branch of engineering is an earned degree which can be obtained after the bachelor's degree.

The curricula are especially designed to meet the needs of students desiring intensive specialization in a particular field or additional course work not ordinarily covered in the normal four-year undergraduate curricula. The professional program of study is offered in chemical, civil, electrical, industrial, materials, mechanical and nuclear engineering.

For detailed information on professional degree requirements, see pages 135-136.

HONORS PROGRAM

The Engineering Honors Program provides enriched educations for academically talented juniors and seniors. The opportunities which distinguish this program from standard programs of study are: 1) considerable flexibility in designing individual program, 2) special courses for honors students, 3) special seminars, 4) individual study or research with a personally chosen professor. Each department has an honors adviser who can provide further information.

COOPERATIVE EDUCATION PROGRAM

A program of cooperative education began in 1968-69 in Engineering. The optional program is planned such that the student may alternate semesters of study with semesters of work during the sophomore and junior academic levels. The freshman and senior years are spent on campus while the sophomore and junior academic levels are spread over a three-year period to permit the sandwiching of the academic semesters with practical work experience semesters. The co-op plan requires five years for completion during which time the student receives approximately 18 months of practical experience.

Students in all curricula in Engineering may participate if they have a grade point average of 2.25 or better. After a student is accepted, he or she is expected to maintain at least a 2.00 grade-point average. Application for admission into the co-op program should be made early in the fall semester of the freshman year; however, later applications resulting in fewer work semesters prior to graduation will be considered. Further information may be obtained from the Director of Cooperative Engineering Education, 236 Riddick Building.

STUDENT ACTIVITIES

Each curriculum in the School of Engineering has a technical society open to every student enrolled in the curriculum. In most cases, these are student chapters of national professional organizations. Each department also has one or more honor societies to give recognition to those with superior academic records. All students are encouraged to participate in these activities as part of their professional education. These organizations together form the Engineers' Council, the coordinating agency for students in their school-wide activities such as Open House and St. Patrick's Day Dance.

HUMANITIES AND SOCIAL SCIENCES

The educated engineer has a foundation in humanities and social sciences as well as in technical studies. Each student in Engineering is required to take a minimum

of 18 hours of humanities and social sciences, approved by his adviser, and made up as follows:

One beginning course in economics (usually EC 201)
One beginning course in history
One beginning course in literature; suggested courses are:
- ENG 205 Studies in Great Works of Literature
- ENG 206 Studies in Drama
- ENG 207 Studies in Poetry
- ENG 208 Studies in Fiction

One course in the history or philosophy of science; suggested courses are:
- HI 321 Ancient and Medieval Science
- HI 322 Rise of Modern Science
- HI 341 Technology in History
- PHI 405 Philosophy of Science
- UNI 301 Science and Civilization
- UNI 302 Contemporary Science and Human Value

Other courses may be chosen from the list below. Students are encouraged to combine courses into a two or three course set, thus providing depth in one area.

Consideration will be given to courses not on the list if a student has a special interest. In selecting courses the student should check carefully to be sure he has the appropriate prerequisites.

LIST OF COURSES

Anthropology Courses

ANT 252 Cultural Anthropology
ANT 305 Peoples of the World

Design Courses

DN 121, 122 History of Design I, II
PD 321, 322, 421, 422 Colloquium (in Product Design) I, II, III, IV

Economics Courses

EC 201 Economics I
EC 301 Production and Prices
EC 302 Aggregate Economic Analysis: Theory & Policy
EC 304 Financial Institutions
EC (HI) 370 Rise of Industrialism
EC (HI) 371 Evolution of the American Economy
EC 410 Public Finance
EC 413 Competition, Monopoly, and Public Policy
EC 431 Labor Economics
EC 440 Economic Development
EC 442 Evolution of Economic Ideas
EC 448 International Economics
EC 475 Comparative Economic Systems

With consent of instructor, EC 201 may be accepted as a prerequisite for all courses now requiring EC 202.

Genetics Courses

GN 301 Genetics in Human Affairs
GN 504 Human Genetics

History Courses

All undergraduate history courses except HI 492 are appropriate.

Literature Courses

ENG 205 Studies in Great Works of Literature
ENG 206 Studies in Drama
ENG 207 Studies in Poetry
ENG 208 Studies in Fiction
ENG 261 English Literature I
ENG 262 English Literature II
ENG 265 American Literature I
ENG 266 American Literature II

ENG 346 Literature of the Western World I
ENG 347 Literature of the Western World II
ENG 371 The Modern Novel
ENG 372 Modern Poetry
ENG 398 Contemporary Literature I—1900-1940
ENG 399 Contemporary Literature II—1940 to present
ENG 453 The Romantic Period
ENG 468 American Romanticism
ENG 469 American Realism and Naturalism
ENG 485 Shakespeare

Modern Language and Literature Courses

Any 201 or higher numbered courses, except 401-402, in any language or literature is appropriate.

Music Courses and Art Courses

MUS 200 Understanding Music
MUS 210 A Survey of Music in America
MUS 215 Music of the 17th and 18th Centuries
MUS 220 Music of the Romantic Period
MUS 320 Music of the 20th Century
ART 200 The Visual Arts in Contemporary Life

Philosophy Courses

PHI 300 Early Western Philosophy
PHI 301 Modern Western Philosophy
PHI 305 Philosophy of Religion
PHI 306 Philosophy of Art
PHI 307 Morality and Human Happiness
PHI 308 Contemporary Moral Philosophy
PHI 309 Contemporary Political Philosophy
PHI 310 Existentialism
PHI 333 Theory of Knowledge
PHI 335 Symbolic Logic
PHI 402 Advanced Logic
PHI 403 Foundations and Philosophy of Mathematics
PHI 405 Philosophy of Science

Politics Courses

All politics courses are appropriate.

Psychology Courses

PSY 200 Introduction to Psychology
PSY 210 Psychological Analysis Applied to Current Problems
PSY 370 Psychology of Personality and Adjustment
PSY 411 Social Psychology

Religion Courses

REL 300 Introduction to Religion
REL 311 The Hebrew Bible
REL 312 Christian Origins
REL 315 Western Religions to the Reformation
REL 316 Western Religions Since the Reformation
REL 321 Religion in American Life
REL (ENG) 325 Religion and the Modern Literary Imagination
REL 327 Contemporary Religious Thought
REL 331 Hinduism and Islam
REL 332 Buddism

Sociology Courses

SOC 202 Principles of Sociology
SOC 301 Human Behavior
SOC 302 Mass Communications and Modern Society
SOC 303 Current Social Problems
SOC 304 Contemporary Family Life
SOC 305 Race Relations
SOC 306 Criminology
SOC 401 Human Relations in Industrial Society
SOC 402 Urban Sociology
SOC 451 Population and Public Affairs

Speech Courses

SP 340 Play Production
SP 420 Development of Rhetorical Theory
SP 430 History and Criticism of American Public Address

University Studies Courses

UNI 303 Man and His Environment
UNI 323 World Population and Food Prospects
UNI 401 The Urban Crisis
UNI 402 Peace and War in the Nuclear Age
UNI 301 Science and Civilization
UNI 302 Contemporary Science and Human Value
UNI 495 Special Topics in University Studies
UNI 595 Special Topics in University Studies

Courses concerned with Man and with the Environment
(See also courses in anthropology, genetics and university studies.)

BO (ZO) 360	Introduction to Ecology
FOR 472	Renewable Resource Management
FOR 572	Conservation Policy Issues
NTR (FS, ANS) 301	Nutrition and Man
ZO 400	Biological Basis of Man's Environment

NOTE: The 18 (21 hours for electrical engineering) hours humanities-social science series are *NOT FREE ELECTIVES*; therefore, by University rules, *CANNOT* be taken on a pass/fail basis. Free elective courses in the humanities and social sciences field, however, can be taken on a pass/fail basis.

Freshman Engineering and Student Services Division

Associate Professor R. H. Hammond, *Director*

Assistant Professor: W. J. Vander Wall; *Senior Advisers:* G. K. Hilliard Jr., B. Houck Jr.; *Instructors:* J. L. Crow, G. A. Finley, J. F. Freeman, E. H. Stinson, B. D. Webb

All students in their first year in the School of Engineering are required to take the same general program of courses. The Freshman Engineering and Student Services Division advises all freshman students on academic affairs and arranges a program of courses which best suits one's individual background and talents and permits one the greatest probability of academic success. This division also offers general counseling service to all engineering students.

Although an entering student may designate the curriculum he or she proposes for a major, it is not necessary to decide upon a major until the end of the freshman year. As each student earns 28 or more credits, it is transferred to the department of his or her choice. This normally is achieved at the end of the spring semester.

The Freshman Engineering and Student Services Division offers assistance to high schools on questions involving engineering as a career. However, its major function is guiding and counseling each freshman engineering student.

TYPICAL FRESHMAN YEAR IN ALL ENGINEERING CURRICULA

	Credits
CH 101 General Chemistry I	4
CH 105 Chemistry—Principles and Applications*	3
E 101 Engineering Graphics I	2
E 120 Engineering Concepts	3
ENG 112 Composition and Reading**	3
Humanities—Social Science***	3
MA 102 Analytic Geometry and Calculus I	4

MA 201 Aanlytic Geometry and Calculus II	4
PY 205 General Physics****	4
Physical Education	2
	32

* Those students who intend to major in chemical engineering or who expect to take additional chemistry courses will take CH 107, Principles of Chemistry, instead of CH 105.

** Qualified students will be offered an advanced placement course, ENG 112H. If a grade of "C" or better is achieved, credit is also given for ENG 111. Qualified students will be notified by the Registrar and during freshman orientation. Other students will be required to take the ENG 111, 112 sequence. In neither case may credits for ENG 111 be used towards graduation requirements.

*** The humanities or social science courses usually suggested are HI 205, Western Civilization Since 1400, or EC 201, Economic Activity.

**** Students who intend to major in nuclear engineering should take PY 201.

The program above is typical. Other courses may be substituted, added, or deleted, dependent upon each student's individual background and talents. Individual programs might range from 28 to 35 credits.

Biological and Agricultural Engineering

(Also see Agriculture and Life Sciences.)

David S. Weaver Laboratories

Professor F. J. Hassler, *Head of the Department*

(For a list of faculty, see Agriculture and Life Sciences, page 57.)

Students in biological and agricultural engineering train to deal with problems of agriculture that are engineering in nature. Scientific and engineering principles are applied to the conservation and utilization of water and soil, the development of power and labor-saving devices for all phases of agricultural production, the design of structures and equipment for housing and handling livestock and field products, and the processing and marketing of farm products.

UNDERGRADUATE CURRICULUM

The science curriculum in biological and agricultural engineering develops young people capable of engineering leadership in agriculture. Emphasis is placed on basic science courses such as mathematics, physics, mechanics, biology, soils, and thermodynamics, which provide a sound background for engineering and agricultural technology. Courses in biological and agricultural engineering are directed to those methods of thought and techniques whereby science can be applied with understanding and judgment to engineering situations related to agricultural operations.

Since training in biological and agricultural engineering involves two distinct technical fields—agriculture and engineering—the science curriculum is a joint responsibility of the two schools and is so administered. Undergraduate students may officially enroll in either school; duplicate undergraduate records are maintained.

OPPORTUNITIES

Biological and agricultural engineers are qualified for positions in design, development and research in public institutions and in industry, and for teaching and extension work in institutions of higher education. The curriculum provides adequate training for postgraduate work leading to advanced degrees, see pages 12-14. Graduates receive the degree of Bachelor of Science in biological and agricultural engineering.

BIOLOGICAL AND AGRICULTURAL ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 202 Analytic Geometry and Calculus III	4	MA 301 Applied Differential Equations I	3
PY 208 General Physics	4	ESM 307 Solid Mechanics I	3
ESM 205 Principles of Engineering Mechanics	3	EE 331 Principles of Electrical Engineering	3
BAE 251 Elements of Biological & Agricultural Engineering	3	SSC 200 Soil Science	4
CSC 111 Algorithmic Languages I	2	Social Sciences & Humanities Elective	3
Physical Education	1	Physical Education	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ESM 305 Engineering Dynamics	3	BAE 342 Agricultural Processing	4
BAE 391 Electrotechnology in Biological & Agricultural Engineering	3	BAE 462 Functional Design of Field Machines	3
BAE 361 Analytical Methods	3	BAE 381 Agricultural Structures & Environment	3
MAE 301 Engineering Thermodynamics I	3	Social Sciences & Humanities Elective	3
BS 100 General Biology	4	Free Elective	3
	16		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BAE 451 Agricultural Engineering Design I	3	BAE 452 Agricultural Engineering Design II	3
BAE (SSC) 471 Agricultural Water Management	4	Advised Technical Elective	3
Social Science & Humanities Elective	6	Free Elective	3
Free Elective	3	Social Science & Humanities Electives	6
	16		15
		Total Hours for Graduation	129

Social Science and Humanities Electives will be selected from the standard engineering school listing.

The curricula above is for the science program in biological and agricultural engineering. For the technology curriculum, see Agriculture and Life Sciences.

Chemical Engineering

Riddick Hall

Professor J. K. Ferrell, *Head of the Department*

Professors: K. O. Beatty Jr., R. P. Gardner, H. B. Hopfenberg, D. C. Martin, J. F. Seely, E. P. Stahel, V. T. Stannett; *Professors Emeriti:* R. Bright, W. L. McCabe, E. M. Schoenborn Jr.; *Adjunct Professors:* F. B. Hill, D. M. Preiss, D. R. Squire; *Associate Professors:* R. M. Felder, D. B. Marsland, R. W. Rousseau; *Adjunct Associate Professor:* T. R. Hauser; *Assistant Professor:* M. R. Overcash; *Adjunct Assistant Professor:* J. L. Williams; *Instructor:* H. M. Winston

Chemical engineering is concerned with the design, optimization and control of processes, equipment and plants in which chemical and physical transformations of matter are carried out. Typical industries relying upon chemical engineering

include those producing chemicals, polymers, synthetic fibers, metals, drugs, glass, food, gasoline, rocket fuels, paper, soap and cement; those producing energy from nuclear fuels; and those processing materials by methods involving chemical reactions.

Real progress in pollution abatement and control must come through the application of chemical engineering techniques. Chemical engineers are qualified to pursue careers in industries such as these in addition to traditional jobs. Biomedical engineering, pollution abatement and control, engineering for the nation's energy requirements are other areas.

CURRICULUM

The chemical engineer's work is diversified so one's education must be broad and basic. The spirit of research and experimentation is vital, so students need to acquire sound scientific backgrounds essential to original thought and independent accomplishment. The undergraduate curriculum emphasizes the engineering, chemical and economic principles involved in chemical processes and operations. The work in chemistry including inorganic, analytical, physical and organic chemistry is comparable to that usually given to chemists with the exception of a reduction of time devoted to laboratory work. Mathematics and science is also stressed.

FACILITIES

Chemical engineering laboratories include pilot plant-type equipment for studying the principles of fluid flow, heat transfer, distillation, absorption, drying, crushing and grinding, filtration, chemical reaction kinetics, etc. Emphasis is placed on the use of both digital and analog computers in the solution of typical chemical engineering problems. Special equipment for research and instructional purposes is designed and built in the departmental laboratories.

OPPORTUNITIES

Graduates find employment in research and development; production, operation and maintenance; management and administration; inspection, testing and process control; technical service and sales; estimation and specification writing; consulting and teaching, and many others. Students desiring to pursue careers in research and development or in teaching and consulting work are advised to consider graduate training, see pages 12-14.

CHEMICAL ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 111 Algorithmic Languages I	2	Humanities and Social Sciences	3
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
MA 202 Analytic Geometry and Calculus III	4	CHE 225 Chemical Process Systems	3
PY 208 General Physics	4	ESM 205 Principles of Engineering Mechanics	3
CHE 205 Chemical Process Principles	3	MA 301 Applied Differential Equations I	3
Physical Education	1	Physical Education	1
	18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 431 Physical Chemistry I	3	CHE 315 Chemical Processes Thermodynamics	3
CH 432 Physical Chemistry Lab.	1	CHE 327 Separation Processes I	3
CHE 311 Transport Processes I	3	CHE 431 Chemical Engineering Lab. I	3
Humanities and Social Sciences	3		

MAT 201	Structure and Properties of Engineering Materials	3
Free Elective		3
		16

Humanities and Social Sciences		3
Chemistry Elective		3
		15

SENIOR YEAR

Fall Semester		*Credits*
CHE 316	Thermodynamics of Chemical & Phase Equilibria	3
CHE 432	Chemical Engineering Lab. II	3
CHE 495	Seminar in Chemical Engineering	1
CHE 446	Chemical Process Kinetics	3
Technical Elective		3
Humanities and Social Sciences		3
		16

Spring Semester		*Credits*
CHE 451	Chemical Engineering Design	3
Technical Elective		3
Humanities and Social Sciences		3
Free Elective		6
		15
Total Hours for Graduation		130

Civil Engineering

Mann Hall

Professor D. L. Dean, *Head of the Department*

Professor P. Z. Zia, *Associate Head of the Department*

Professors: M. Amein, W. F. Babcock, C. R. Bramer, P. D. Cribbins, J. F. Ely, R. E. Fadum, C. L. Heimbach, A. I. Kashef, L. J. Langfelder, W. G. Mullen, C. Smallwood Jr., M. E. Uyanik, H. E. Wahls; *Adjunct Professor:* R. L. Nace; *Associate Professors:* G. H. Blessis, W. S. Galler, K. S. Havner, J. F. Mirza, J. C. Smith, G. R. Taylor, C. C. Tung; *Adjunct Associate Professors:* C. P. Fisher Jr., D. R. Johnston, S. D. Shearer Jr.; *Assistant Professors:* W. J. Head, J. L. Machemehl, H. R. Malcom Jr.; *Extension Specialist:* R. F. DeBruhl; *Adjunct Instructor:* T. H. McDowell

Civil engineering is one of the broadest of the various fields of engineering. It is a discipline traditionally concerned with the improvement and control of environment and dealing with the planning, design and construction of buildings, dams, bridges, harbor works, water works, water and nuclear power facilities, sewage disposal works, nuclear waste facilities, and transportation systems including highways, railways, waterways, airports and pipe lines. Graduates in civil engineering are in demand by public agencies and by private industries. Employment varies from assignments in design offices or in the field, in small communities or large industrial centers.

The Department of Civil Engineering offers programs of study which provide adequate academic preparation to those contemplating a career in the civil engineering profession. The undergraduate program provides a sound general education and prepares the student for advanced study either by graduate study (see degrees offered, pages 12-14) or by self-study.

FACILITIES

Learning is facilitated by laboratories for testing structural materials, large models or full-scale structures, soils and bituminous products, for hydraulic experiments, for studies in airphoto interpretation and photogrammetry, for analysis of small structural models, for chemical and biological tests pertaining to sanitary engineering, and for the investigation of transportation problems.

UNDERGRADUATE CURRICULA

Two four-year undergraduate curricula are offered; one leads to a Bachelor of Science in civil engineering; the other, to a Bachelor of Science in civil engineering, construction option.

The civil engineering curriculum is a balanced program providing academic discipline in the pure and applied physical sciences, the humanities and social sciences, and the professional aspects of civil engineering including structural, transportation and sanitary engineering, and soil mechanics and foundations.

The curriculum in the civil engineering construction option is designed for those interested in the construction phases of civil engineering. It includes the core course requirements in the physical sciences and the social sciences and humanities as established for all N. C. State engineering curricula. The curriculum includes a three semester sequence of courses in cost analysis and control, and construction methods and planning. The courses, unique to this curriculum, are designed to provide academic discipline in the engineering, planning and management aspects of construction.

CIVIL ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 202 Introduction to Civil Engineering+	3	GY 120 Physical Geology+	3
ESM 200 Introduction to Mechanics	3	MAT 200 Mechanical Properties of Structural Materials	2
MA 202 Geometry & Calculus III	4	E 301 Mechanics of Solids	3
PY 208 General Physics	4	MA 301 Applied Differential Equations I	3
Humanities & Social Science*	3	Humanities & Social Science*	3
Physical Education	1	Free Elective	3
	17	Physical Education	1
			18

+ May be taken in reverse semesters.

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 301 Engineering Surveying	3	CE 305 Transportation Engineering I	4
CE 325 Structural Analysis	3	CE 326 Structural Engineering I	4
CE 332 Materials of Construction	3	CE 342 Soils Engineering I	4
CE 382 Hydraulics	4	CE 383 Water Resource Engineering I	4
IE 311 Engineering Project Analysis	3		16
	16		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE Electives**	6	CE 450 Civil Engineering Design	3
Engineering Science Elective***	3	CE Elective	3
Free Elective	3	Free Elective	3
Humanities & Social Science*	3	Humanities & Social Science*	6
	15		15
		Total Hours for Graduation	129

* Humanities and social science courses to be selected from the standard school pattern.

** Two courses selected from: CE 406 Transportation Engineering II
CE 427 Structural Engineering II
CE 443 Soils Engineering II
CE 484 Water Resources Engineering II

*** Thermodynamics, engineering science and mechanics, electrical engineering or materials engineering.

CONSTRUCTION OPTION CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 202 Introduction to Civil Engineering+	2	GY 120 Physical Geology+	2
MA 202 Analytic Geometry & Calculus III	4	GY 110 Physical Geology Laboratory	1
PY 208 General Physics	4	MAT 200 Mechanical Properties of Structural Materials	2
ESM 200 Introduction to Mechanics	3	ESM 301 Mechanics of Solids	3
Humanities & Social Science*	3	MA 301 Applied Differential Equations	3
Physical Education	1	Humanities & Social Science*	3
	17	Free Elective	3
		Physical Education	1
			18

+ May be taken in reverse semesters

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 301 Engineering Surveying	3	CE 305 Transportation Engineering I or	
CE 325 Structural Analysis	3	CE 383 Water Resource Engineering I	4
CE 332 Materials of Construction	3	CE 326 Structural Engineering I	4
CE 382 Hydraulics	4	CE 342 Soils Engineering I	4
IE 311 Engineering Economic Analysis	3	CE 365 Construction Engineering I	4
	16		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 463 Cost Analysis and Control	3	CE 460 Construction Engineering Project	3
CE 466 Construction Engineering II	3	CE 464 Legal Aspects of Contracting	3
Engineering Science Elective**	3	Free Elective	3
Free Elective	3	Humanities & Social Science*	6
Humanities & Social Science*	3		15
	15	Total Hours for Graduation	129

* Humanities and Social Science courses to be selected from standard school pattern.
** Thermodynamics, Engineering Science and Mechanics, Electrical Engineering, or Materials Engineering.

PROFESSIONAL STUDY IN CIVIL ENGINEERING

Fifth-year programs of study leading to the professional degree of Civil Engineer are offered in: sanitary engineering, soil mechanics and foundation engineering, structural engineering and transportation engineering. Examples of these specialty fields are available through the department. The fifth-year curricula of advanced course work are offered as a continuation of the four-year undergraduate program and are designed for students who wish to be technically proficient in a civil engineering specialty. A curriculum is designed in consultation with the student's adviser to suit particular interests.

Regulations governing the professional program are shown on pages 135 and 136.

POST-BACCALAUREATE STUDY IN CIVIL ENGINEERING RELATED TO OTHER FIELDS

Transportation Engineering or City and Regional Planning—There is a need for the coordination of transportation facilities and land planning. To fulfill this need, an advanced program leading to a post-baccalaureate degree in engineering with a major in transportation engineering, and to the degree of Master of Regional Plan-

ning is offered through the combined resources of the Department of Civil Engineering at North Carolina State University and the Department of City and Regional Planning at the University of North Carolina at Chapel Hill.

The minimum residence requirements include two academic years plus a summer internship. A bachelor's degree in engineering, including a knowledge of transportation engineering, from an institution of recognized standing is required for admission to the program. Applicants who do not meet these requirements in full may submit their credentials for examination and consideration.

Further information may be obtained from the co-sponsoring departments.

Water Resources—To meet industry's need for personnel with training in water supply and the abatement of water pollution, students in the many curricula leading to positions in industry (food processing, textile chemistry, pulp and paper technology, chemical engineering, zoology and others) may consider courses in sanitary engineering for advanced undergraduate electives and for minor sequences for advanced degrees. Among appropriate courses are: CE 484, Water Resources Engineering II; CE 571, Theory of Water and Waste Treatment; CE 573, Unit Operations and Processes in Waste Treatment; CE 673, Industrial Water Supply and Waste Disposal; CE 674, Stream Sanitation.

In addition to programs in water supply and pollution control, students may major in hydraulics and hydrology. These programs are developed in conjunction with engineering science and mechanics and agricultural engineering. For further information write the Department of Civil Engineering.

Electrical Engineering

Daniels Hall

Professor L. K. Montieth, *Head of the Department*

Professor W. D. Stevenson Jr., *Associate Head of the Department*

Professors: W. J. Barclay, A. R. Eckels, W. A. Flood, J. R. Hauser, N. F. J. Matthews, J. B. O'Neal Jr., D. R. Rhodes, J. Staudhammer, F. J. Tischer; *Adjunct Professors:* G. K. Megla, J. J. Wortman; *Professor Emeritus:* G. B. Hoadley; *Associate Professors:* N. R. Bell, W. T. Easter, J. W. Gault, T. H. Glisson, A. J. Goetze, M. A. Littlejohn, E. G. Manning, W. C. Peterson, W. P. Seagraves; *Adjunct Associate Professors:* E. Christian, J. D. Spragins, M. G. Zaalouk; *Associate Professors Emeriti:* K. B. Glenn, E. W. Winkler; *Assistant Professors:* L. R. Herman, J. F. Kauffman, G. G. Reeves, A. T. Shankle, R. W. Stroh; *Adjunct Assistant Professors:* S. G. Burgiss, D. A. Cotter, J. R. Suttle

Electrical engineering includes such specialized fields as communications, digital systems, electric power, electronics and microwave engineering. The student is prepared for any of these professional activities by starting with a thorough grounding in engineering science followed by fundamental electrical theory and advanced subject matter. The advanced subject matter is offered through elective courses which emphasize antennas, radio wave propagation, automatic control, digital systems, communications, telemetering, electronics, the design of electrical and electronic systems, electrical power production, the utilization of electric power, electronics in medicine, instrumentation, semiconductor devices, integrated circuits, and other vital and rapidly developing concerns. By appropriate choice of elective courses a student may follow a suggested program in one of the specialized fields of electrical engineering or may choose electives to achieve an individualized program of study.

CURRICULUM

The curriculum in electrical engineering includes comprehensive training in mathematics and physics—fundamental sciences—and adequate training in allied branches of engineering. The electrical engineering courses specified in the curriculum during the sophomore and junior years provide the fundamental electrical theory for all EE majors. Specialization is achieved primarily during the senior year through appropriate choices of elective courses. Most courses are accompanied by coordinated work in the laboratory and by application of theory in the solutions to carefully planned problems. Laboratories are for the study of servomechanisms and control, electronics and communications, circuits, instrumentation, computers, microwaves, antennas, electromagnetic fields and waves, electric filters and electrical machinery. Also there are a number of research laboratories, especially in semiconductor materials and devices, computers and electromagnetics.

Each student, with a faculty adviser's assistance, is required to plan a coordinated program which will meet the requirements for a Bachelor of Science in electrical engineering. Qualified students may coordinate their senior year with a plan for graduate study (see degrees, pages 12-14).

In addition to School of Engineering graduation requirements, attendance at two professional electrical engineering society meetings, one in the junior year and one in the senior year, is required.

Also a minimum of six continuous weeks of gainful employment is required. A wide variety of employment may be used, but technical work while in military service or for a school does not satisfy this requirement. Evidence of employment will consist of a letter from the employer setting forth inclusive dates of employment, character of work performed and an evaluation of the student's work.

ELECTRICAL ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EE 201 Electric Circuits I	4	EE 202 Electric Circuits II	4
Humanities & Social Science*	3	ESM 205 Principles of Engineering Mechanics	3
MA 202 Analytic Geometry and Calculus III	4	Humanities & Social Science*	3
PY 208 General Physics	4	MA 301 Applied Differential Equations I	3
Physical Education	1	Physical Education	1
	16		14

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EE 303 Electromagnetic Fields I	3	EE 304 Electromagnetic Fields II	3
EE 314 Electronic Circuits	4	EE 305 Electromechanical Systems	4
ESM 301 Mechanics of Solid or ESM 303 Fluid Mechanics I	3	EE 401 Advanced Electric Circuits	3
Humanities & Social Science*	3	Humanities & Social Science*	3
Free Elective	3	Free Elective	3
	16		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EE 440 Fundamentals of Digital Systems	3	ENG 321 The Communication of Technical Information	3
Departmental Elective**	3	Departmental Elective**	3
Humanities & Social Science*	3	Humanities & Social Science*	3
MA, PY or ST Elective	3	MAE 301 Engineering Thermodynamics I	3
Free Elective	3	Free Elective	3
	15		15

Total Hours for Graduation 124

* A total of 21 hours in the humanities and social sciences, including either UNI 401 or UNI 402, is required. The other hours will be according to the standard school program.

** Chosen from an approved list of EE 400- and 500-level course sequences.

Engineering Operations

Riddick Hall

Associate Professor W. T. Easter, *Director*

Engineers not only design equipment and structures; they operate and control production systems, perform management and supervision at all levels, plan and maintain plant facilities, and market technical products. These latter functions may be grouped together under the general term "operations"—the ongoing tasks of providing needed goods and services in an economical, safe and healthful manner. Engineering careers in operations are well suited to people who have interest in both technical and business matters and who find satisfaction in accomplishing objectives through working with people.

CURRICULUM

Engineering operations is an interdepartmental program of study leading to the Bachelor of Science degree. Starting with a foundation of basic arts and sciences, the curriculum builds a thorough grounding in general engineering fundamentals and applications along with a strong introduction to the concepts and practices of business management. Additional depth in an area of the student's choice is provided by a technical elective sequence taken in the junior and senior years. Three standard sequences—production control, industrial ceramics and electrical—are presently available, and others in occupational safety and health and engineering management are being planned. Alternatively, the student may take a special sequence tailored to individual needs.

JOINT PROGRAMS

The School of Engineering operates joint programs in engineering operations (production sequence) with the Universities of North Carolina at Asheville and at Wilmington. A student at either school can complete up to 90 of the 128 credits before transferring to North Carolina State University. The remaining 38 credits can often be completed in one calendar year. Additional details are given in the UNC-A and UNC-W catalogs.

OPPORTUNITIES

Engineering operations graduates find careers not only in manufacturing companies, but also in the military services, governmental agencies and in service firms such as utilities, contractors, consultants, financial institutions and transportation companies.

Those who wish further education typically go into master's programs in management or business administration; some, however, enter related graduate engineering programs or other professional schools such as law and medicine.

ENGINEERING OPERATIONS CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 202 Analytic Geometry & Calculus III	4	MAT 201 Structure and Properties of Engineering Materials	3
PY 208 General Physics	4	ACC 260 Accounting I—Concepts of Financial Reporting	3
ESM 211 Introduction to Applied Mechanics	3	ESM 212 Mechanics of Engineering Materials	3
E 207 Engineering Graphics III	2	Humanities and Social Sciences*	3
Humanities and Social Sciences*	3	Free Elective	3
Physical Education	1	Physical Education	1
	17		16

JUNIOR YEAR

Fall Semester	*Credits*
MAE 307 Energy and Energy Transformations	3
ST 361 Introduction to Statistics for Engineers	3
ACC 262 Managerial Uses of Cost Data	3
CSC 111 Algorithmic Languages I	2
Technical Sequence**	3
Humanities and Social Sciences*	3
	17

Spring Semester	*Credits*
EE 350 Electric Power Utilization in Manufacturing Processes	3
IE 301 Engineering Economy	3
IE 328 Manufacturing Processes	3
Technical Sequence**	3
Free Elective	3
	15

SENIOR YEAR

Fall Semester	*Credits*
EC 202 Economics II or EC 326 Personnel Management	3
EO 491 Seminar in Engineering Operations	1
Technical Sequence**	6
Humanities and Social Sciences*	3
Free Elective	3
	16

Spring Semester	*Credits*
IE 420 Manufacturing Controls	3
Technical Sequence**	6
Humanities and Social Sciences*	3
Free Elective	3
	15

Total Hours for Graduation 128
(125 with the electrical sequence)

* Courses in the humanities and social sciences are to follow the standard plan for the School of Engineering. See pages 112-115.

** Students may follow a standard or an approved individualized technical elective sequence as outlined below.

TECHNICAL ELECTIVE SEQUENCES

JUNIOR	F	S
1. *Production:* (total 19 credits)		
EC 332 Industrial Relations	3	
IE 443 Quality Control		3
	3	3
2. *Industrial Ceramics:* (total 19 credits)		
MAT 311 Ceramic Processing I	4	
MAT 312 Ceramic Processing II		3
	4	3
3. *Electrical:* (total 18 credits)		
EE 350 Electric Power Utilization in Manufacturing Processes (3) will not be taken.		
EE 201, 202 Electric Circuits I, II	4	4
	4	4
4. *Individualized:* (total 18 credits)		
Tailored to the specific needs of individual students. See the program director for further information.		

SENIOR	F	S
IE 332 Motion & Time Study	4	
IE 343 Plant Layout and Materials Handling		3
Technical Electives	3	3
	7	6
MAT 417 Ceramic Subsystem Design		3
Technical Electives	6	3
	6	6
EE 314 Electronic Circuits	4	
EE 440 Fundamentals of Digital Systems		3
EE Elective		3
	4	6

Engineering Science and Mechanics

Riddick Hall

Professor P. H. McDonald Jr., *Head of the Department*

Professor R. A. Douglas, *Associate Head of the Department*

Professors: T. S. Chang, J. A. Edwards, E. G. Humphries; *Professor Emeritus:* A. Mitchell; *Associate Professors:* W. L. Bingham, M. H. Clayton, E. D. Gurley, Y. Horie, C. J. Maday, F. Y. Sorrell Jr.; *Assistant Professors:* W. L. Liddell Jr., T. E. Smith Jr.; *Assistant Professor and Extension Specialist:* H. M. Eckerlin; *Adjunct Assistant Professors:* D. I. McRee, M. T. Mettrey

Engineering Science and Mechanics' educational program aims at: 1) basic preparation in mechanics, materials, electromagnetics, thermodynamics, and systems studies, 2) understanding the principal technological and scientific ideas on which contemporary society depends for its sustenance and growth, and 3) a curriculum flexible enough to allow the students to pursue personal plans to needed levels of professional competence.

Graduates of this program are employed as lone investigators at universities, government laboratories and corporate research establishments. Others work as a member of a group or team assembled to pursue specific goals and tasks. Still others are self-employed, either as members of professional consulting firms or as managers or owners of business firms in a broad field of activities which includes services, product development and research. A number of these graduates have pioneered in originating and synthesizing new branches of human endeavor both in new areas of knowledge and in new forms of service to society.

CURRICULUM

In addition to "timeless" engineering subjects, the curriculum can be flexible through use of electives. Each student is aided in developing a program suited to one's own needs and desires while planned sequences of electives insure that the total program strength is not sacrificed to momentary interest.

The undergraduate curriculum involves study of the behavior of particles and systems of rigid and deformable solids. It treats fluids, the microscopic and macroscopic behavior of materials, thermodynamics and transport phenomena. Supporting courses introduce electromagnetic circuits and electronics in addition to mathematics, classical and modern physics, chemistry and humanities and social studies.

In the senior year, the student conducts independent studies in real engineering systems bearing high relevance to the profession and to society.

Learning is aided by such devices as accelerometers, hot wire anemometers, pressure probes, strain gages and associated recording equipment. Interferometry, birefringence and other optical techniques are used to study the behavior of solids, fluids and plasmas. Laboratories are equipped with pulsed and continuous wave lasers as well as ultra high speed cameras capable of "freezing" impact phenomena in solids and shock wave radiation phenomena in plasmas. A unique facility is a hypervelocity gun, capable of accelerating projectiles to velocities near five miles per second.

For graduate degrees, see pages 12-14.

ENGINEERING SCIENCE AND MECHANICS CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*
ESM 205 Principles of Engineering Mechanics	3
ESM 206 Introductory Applications in Mechanics	1
MA 202 Analytic Geometry and Calculus III	4
PY 201 General Physics	4
EE 201 Electric Circuits I	4
Physical Education	1
	17

Spring Semester	*Credits*
ESM 305 Engineering Dynamics	3
MAT 201 Structure and Properties of Engineering Materials	3
MA 301 Applied Differential Equations I	3
PY 202 General Physics	4
Humanities and Social Science**	3
Physical Education	1
	17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ESM 307 Solid Mechanics I	3	Technical Elective (Stem A)*	3
ESM 303 Fluid Mechanics I	3	Technical Elective (Stem B)*	3
MA 401 Applied Differential Equations II	3	Technical Elective (Stem C)*	3
ESM 311 Experimental Engineering Science I	3	Free Elective	3
Humanities and Social Science**	3	Humanities and Social Science**	3
	15		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ESM 411 Engineering Cybernetics I	3	ESM 412 Engineering Cybernetics II	3
Technical Elective (Stem A)*	3	ESM 415 Engineering Science in Contemporary Design	2
Technical Elective (Stem B)*	3	Free Elective	6
Technical Elective (Stem C)*	3	Humanities and Social Science**	3
Humanities and Social Science**	3		14
	15		

Total Hours for Graduation 125

* Technical Elective Stems:
These courses will be selected in consultation with the adviser; from several broad interdepartmental groups, according to the individual student's educational objectives. The grouped subject areas include:

Stem A: fluid mechanics, thermodynamics, heat and mass transfer
Stem B: solid mechanics, dynamics, materials
Stem C: general, such as, mathematics, electronics, electromagnetics, systems, structures, biomechanics, geosciences

** See pages 112-115 for information about the humanities and social science sequence.

Industrial Engineering

Riddick Engineering Laboratories

Professor W. A. Smith Jr., *Head of the Department*

Professor S. E. Elmaghraby, *Associate Head of the Department*

Professors: C. A. Anderson, J. R. Canada, R. G. Carson Jr., R. W. Llewellyn, R. G. Pearson, A. L. Prak; *Associate Professors:* R. E. Alvarez, R. H. Bernhard, J. J. Harder, H. L. W. Nuttle; *Assistant Professors:* M. A. Ayoub, M. J. Magazine, G. E. Tucker; *Adjunct Assistant Professor:* K. R. Baker; *Instructor:* D. J. Kulonda

The industrial engineer designs, improves and installs integrated systems of people, materials, equipment, and information. One draws upon specialized knowledge and skill in the mathematical, physical and social sciences, together with the principles and methods of engineering analysis and design to specify, predict and evaluate the results to be obtained from these systems. The industrial engineer may design work and control systems for many diverse activities, such as a hospital, a department store, a manufacturing enterprise, an insurance office or government functions. His position in an organization is usually as a management adviser in contact with every phase of the organization.

The curriculum blends a basic group of common engineering technical courses with specialized courses in the major areas of industrial engineering—design of man and machine systems, design of management control systems, and improvement of manufacturing operations. The course offerings stress mathematical and statistical techniques of industrial systems analysis; quantitative methodologies of

operations research; computers as a tool for problem solving and simulation; economic considerations of alternatives; control of product or service quality and quantity; specifications of the manufacturing process including the equipment and tooling; and the utilization of safety and human factors engineering principles.

Industrial engineering's undergraduate program leads to a Bachelor of Science degree in industrial engineering. For graduate degrees, see pages 12-14. The department also offers a Bachelor of Science in furniture manufacturing and management which is described on pages 129-130.

INDUSTRIAL ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
IE 200 Introduction to Industrial Engineering	1	ESM 205 Principles of Engineering Mechanics	3
Humanities and Social Science*	3	Humanities and Social Science*	3
MA 202 Analytic Geometry & Calculus III	4	IE 311 Engineering Economic Analysis	3
MAT 201 Structures & Properties of Engineering Materials	3	MA 301 Applied Differential Equations I	3
PY 208 General Physics	4	ST 371 Introduction to Probability & Statistics	4
Physical Education	1	Physical Education	1
	16		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 111 Algorithmic Languages I	2	ACC 260 Accounting I—Concepts of Financial Reporting	3
IE 351 Manufacturing Engineering	3	IE 352 Work Analysis & Design	3
IE 353 Statistical Quality Control	3	IE 354 Human Factors Engineering	3
IE 361 Quantitative Methods in Industrial Engineering	3	IE 401 Industrial Engineering Analysis I	3
Engineering Mechanics Elective	3	Free Elective	3
Humanities and Social Science*	3		
	17		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EE 331 Principles of Electrical Engineering	3	IE 421 Data Processing & Production Control Systems	3
EE 339 Principles of Electrical Engineering Lab I	1	Advised Technical Elective	3
MAE 301 Engineering Thermodynamics I	3	Engineering Science Elective	3
Advised Technical Elective	3	Free Elective	3
Free Elective	3	Humanities and Social Science*	3
Humanities and Social Science*	3		15
	16	Total Hours for Graduation	128

* See pages 112-115 for information about the humanities electives.

PROFESSIONAL STUDY

A professional degree can be gained in a fifth year of study. Each student in consultation with his or her adviser selects a specialty and develops a program of study. Common specialties include production engineering, management decision-systems, or management engineering. Regulations concerning the professional programs are shown on pages 135-136.

Furniture Manufacturing and Management

James T. Ryan Professor Anco L. Prak, *In Charge*

Instructor: T. W. Myers; *Furniture Extension Specialist:* E. L. Clark

The furniture industry ranks second only to the automobile as a producer of consumer durable goods. The industry is the second largest industrial employer in North Carolina and produces over 25 per cent of the furniture made in the U.S.A. The industry is changing rapidly with the introduction of mechanization, new materials and sophisticated management controls.

The furniture manufacturing and management program is the only one of its kind in the country. It receives industry support and guidance. Plant and market field trips combined with project type instruction give students in-depth understanding of manufacturing. The faculty keeps abreast of industry problems through close contact with the Southern Furniture Manufacturers Association and by doing applied research and extension work.

The cooperative education program is well suited to the furniture manufacturing and management curriculum.

CURRICULUM

The degree of Bachelor of Science in furniture manufacturing and management prepares graduates for technical and managerial positions in the industry.

The curriculum stresses the application of engineering and technology to furniture manufacturing. Related subjects such as management, accounting and economic analysis cover the business side of modern furniture production systems.

In addition to academic course work, a minimum of six weeks of continuous, gainful employment in a furniture manufacturing plant is required. Usually, such employment is between the junior and senior years.

FURNITURE MANUFACTURING AND MANAGEMENT CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
E 240 Furniture Graphics	3	CSC 111 Algorithmic Languages I	2
PY 212 General Physics	4	IE 241 Furniture Manufacturing Processes I	3
SP 231 Expository Speaking	3	ST 361 Introduction to Statistics for Engineers	3
Humanities and Social Science*	3	WPS 201 Wood Structure & Properties	3
Physical Education	1	Humanities and Social Science*	3
	14	Physical Education	1
			15

SUMMER PRACTICUM

	Credits
WPS 205	5

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
IE 321 Business Data Processing	3	IE 301 Engineering Economy	3
IE 332 Motion and Time Study	4	IE 341 Furniture Plant Layout & Design	3
IE 340 Furniture Manufacturing Processes II	4	IE 443 Quality Control	3
Humanities and Social Science*	3	Advised Elective	3
	14	Free Elective	3
			15

SENIOR YEAR

Fall Semester	*Credits*
ACC 260 Accounting I—Concepts of Financial Reporting	3
IE 420 Manufacturing Controls	3
IE 440 Furniture Manufacturing Analysis	3
Advised Elective	4
Humanities and Social Science*	3
	16

Spring Semester	*Credits*
EC 326 Personnel Management or EC 332 Industrial Relations	3
Advised Elective	3
Free Elective	6
Humanities and Social Science*	3
	15
Total Hours for Graduation	126

* See pages 112-115 for information about the humanities electives.

Materials Engineering

Page Hall

Professor W. W. Austin Jr., *Head of the Department*

Professors: J. R. Beeler Jr., R. B. Benson Jr., A. A. Fahmy, J. K. Magor, C. R. Manning Jr., K. L. Moazed, H. Palmour III, H. H. Stadelmaier, R. F. Stoops; *Adjunct Professor:* H. M. Davis; *Associate Professors:* J. V. Hamme, G. O. Harrell; *Adjunct Associate Professor:* G. Mayer; *Assistant Professor:* R. F. Davis; *Adjunct Assistant Professor:* J. C. Hurt; *Special Lecturer:* K. R. Brose

The Department of Materials Engineering offers education and professional development which qualifies graduates as technical and administrative leaders for industries and government agencies involved with design, development, selection and processing of engineering materials. Typical industries served by materials engineers are: aerospace, electrical and electronics, construction, nuclear power and transportation.

CURRICULA

The undergraduate curriculum is comprised of a three-year program of fundamental courses followed by a fourth year in which the student chooses a specialty area: ceramic engineering, metallurgical engineering, polymeric materials, materials processing, or materials engineering (general). A fifth year professional program is available for advanced work and further specialization in these fields.

Graduate degrees are available, see pages 12-14, and consult the Graduate Catalog.

Well-equipped laboratories aid research and instruction in: Aüger spectroscopy, x-ray diffraction, differential thermal analysis, thermogravimetric analysis, electron microprobe analysis, radiography, metallography, electron microscopy, mechanical behavior of materials and nuclear fuel research.

OPPORTUNITIES

Materials engineers job opportunities include those in research and development of new materials needed in the rapidly expanding fields of chemical, mechanical, aerospace, electronic and nuclear technology. With the continued industrial development of the South and the State of North Carolina, opportunities are developing for materials engineers to play a vital role in maintaining state and regional progress.

Professional training in materials engineering provides opportunities for employment in industries producing or consuming essential products including metals and alloys, glass in all its forms, enamels and protective coatings for metals, structural clay products such as brick and tile, thermal insulators, electrical insulators, electronic devices; plastics, and composite materials.

PROFESSIONAL STUDY

In addition to the regular graduate program a fifth or professional year of post-graduate study is offered in materials engineering. This program of advanced course work leads to the degree of Materials Engineer. It is especially designed for students planning careers in consulting, production activities or in technical service and sales. Each program of study is individually designed. Regulations covering professional study are shown on pages 135-136.

MATERIALS ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

	Credits Fall	Credits Spring
MA 202 Analytic Geometry and Calculus III	4	0
MA 301 Applied Differential Equations I	0	3
PY 208 General Physics	4	0
Humanities and Social Science*	3	3
MAT 201 Structure and Properties of Engineering Materials	3	0
ESM 205 Principles of Engineering Mechanics	0	3
EE 331, 339 Principles of Electrical Engineering & Laboratory	0	4
Physical Education	1	1
CSC 111 Algorithmic Languages I	2	0
Elective	0	3
	17	17

JUNIOR YEAR

	Credits Fall	Credits Spring
MAE 301 or CH 331 Engineering Thermodynamics I or	3	0
Introductory Physical Chemistry or	4	0
MAT 301 Equilibrium & Rate Processes in Materials Science	0	3
MAT 310 Physical Examination of Materials	3	0
MAT 450 Mechanical Properties of Materials	0	3
MAT 411, 412 Physical Principles in Materials Science I, II	3	3
Humanities and Social Science*	3	3
ESM 307 Solid Mechanics I	3	0
Elective	0	3
	15-16	15

SENIOR YEAR

	Credits Fall	Credits Spring
MAT 401 Materials Processing	3	0
MAT 431 Physical Metallurgy I	3	0
MAT 435 Physical Ceramics I	3	0
MAT 423 Materials Factors in Design I	0	3
CHE 325 Introduction to Plastics	3	0
Humanities and Social Sciences*	0	3
Technical Electives**	3	3
Technical Electives**	0	3
Free Elective	0	3
	15	15

Hours Required for Graduation ..... 126 or 127

* Humanities and social science courses will be taken according to the standard pattern for the School of Engineering.

** Technical electives provide an identifiable specialty sequence in ceramic engineering, metallurgical engineering or materials engineering in general.

Mechanical and Aerospace Engineering

Broughton Hall

Professor C. F. Zorowski, *Head of Department*

Professor J. C. Williams III, *Associate Head of Department*

Professors: J. A. Bailey, R. F. Barrett, F. R. DeJarnette, B. H. Garcia Jr., W. C. Griffith, F. J. Hale, F. D. Hart, H. A. Hassan, R. B. Knight, M. N. Ozisik, J. N. Perkins, F. O. Smetana, J. K. Whitfield, J. Woodburn; *Adjunct Professors:* R. W. Graham, J. J. Murray, E. A. Saibel; *Professors Emeriti:* H. B. Briggs, J. S. Doolittle, R. M. Pinkerton; *Associate Professors:* E. M. Afify, T. H. Hodgson, C. J. Moore Jr., J. C. Mulligan, L. H. Royster; *Adjunct Associate Professors:* E. S. Armstrong Jr., R. E. Singleton, E. C. Yates; *Associate Professors Emeriti:* W. E. Adams, W. S. Bridges; *Assistant Professors:* J. R. Bailey, J. A. Daggerhart Jr., T. H. Pierce, W. F. Reiter Jr.; *Adjunct Assistant Professors:* G. L. Smith, J. S. Stewart, J. R. Yow; *Assistant Professor Emeritus:* T. J. Martin Jr.; *Instructor:* G. O. Batton; *Extension Specialist:* A. S. Boyers

Engineers satisfy human needs through the application of scientific knowledge to convert natural resources and create new technical systems and processes. A prime motivation is to place these results within the economic reach of a vast segment of humanity. To identify and fulfill human needs, the modern engineer requires a sound educational background in basic science, mathematics, technology and the humanities. The gap between the discoveries of science and its application to fulfill the technological needs of society is bridged by engineering science and technology. Departments of engineering educate students in these areas of applied science and the development of talents and skills in their application coupled with an understanding of the human and social aspects involved.

Mechanical engineers specialize in the generation of power and the design of machines and processes that apply mechanical and thermal energy to useful purposes. Some areas of application include conventional and nuclear power generation; automotive and turbine engines; heating, air conditioning and refrigeration; air, sea, and land vehicles, machine tools, home appliances, manufacturing equipment, instrumentation and industrial controls; and pollution abatement systems.

Aerospace engineering shares responsibility for many of the areas listed above but is principally concerned with the design and the analysis of the performance, stability, and control of modern aircraft, both commercial and private, and space vehicles. It also focuses on ground and airborne support equipment; solid, liquid, and electric propulsion systems, and aerodynamics—the interaction between the vehicle and the atmosphere.

Because of the close relationship between mechanical and aerospace engineering, both curricula are administered by one department. There is cooperation between the two disciplines in which responsibility for subject areas such as thermodynamics, heat and mass transfer, vibrations, acoustics, fluid mechanics, propulsion and control theory is shared.

The Bachelor of Science degree is available in both aerospace engineering and mechanical engineering. Graduate degrees are also offered, see pages 12-14, and consult the Graduate Catalog.

MECHANICAL ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 202 Analytic Geometry and Calculus III	4	MAE 216 Elements of Mechanical Engineering	3
PY 208 General Physics	4	MA 301 Applied Differential Equations I	3
ESM 205 Principles of Engineering Mechanics	3	ESM 305 Engineering Dynamics	3

Humanities, Social Sciences* or	
Free Elective	3
Physical Education	1
	15

CSC 111 Algorithmic Languages I	2
Humanities, Social Sciences* or	
Free Elective	3
Physical Education	1
	15

JUNIOR YEAR

Fall Semester	*Credits*
MAE 301 Engineering Thermodynamics I	3
MAE 305 Mechanical Engineering Laboratory I	1
MAE 316 Strength of Mechanical Components	3
EE 331 Principles of Electrical Engineering	3
MAT 201 Structure and Properties of Engineering Materials	3
Humanities, Social Sciences* or	
Free Elective	3
	16

Spring Semester	*Credits*
MAE 302 Engineering Thermodynamics II	3
MAE 306 Mechanical Engineering Laboratory II	1
MAE 315 Dynamics of Machines	3
EE 332 Principles of Electrical Engineering	3
ESM 303 Fluid Mechanics I	3
Humanities, Social Sciences* or	
Free Elective	3
	16

SENIOR YEAR

Fall Semester	*Credits*
MAE 401 Energy Conversion or	
MAE 402 Heat & Mass Transfer	3
MAE 405 Mechanical Engineering Laboratory III	1
MAE 415 Mechanical Engineering Analysis	3
Departmental Elective	3
Humanities, Social Sciences* or	
Free Elective	6
	16

Spring Semester	*Credits*
MAE 402 Heat & Mass Transfer or	
MAE 401 Energy Conversion	3
MAE 416 Mechanical Engineering Design	4
Departmental Elective	3
Humanities, Social Sciences* or	
Free Elective	6
	16
Total Hours for Graduation	126

Students may elect to take PY 201, 202 and 203 in place of PY 205, 208. Rearrangement of the schedule of courses to accomplish this will be worked out in consultation with the student's adviser.

* See pages 112-115 for information concerning the humanities, social science sequence.

AEROSPACE ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*
MA 202 Analytic Geometry and Calculus III	4
PY 208 General Physics	4
ESM 205 Principles of Engineering Mechanics	3
Humanities, Social Sciences* or	
Free Elective	3
Physical Education	1
	15

Spring Semester	*Credits*
MAE 250 Introduction to Aerospace Engineering	3
MA 301 Applied Differential Equations I	3
ESM 305 Engineering Dynamics	3
CSC 111 Algorithmic Languages I	2
MAT 201 Structures & Properties of Engineering Materials I	3
Physical Education	1
	15

JUNIOR YEAR

Fall Semester	*Credits*
MAE 301 Engineering Thermodynamics I	3
MAE 355 Aerodynamics I	4

Spring Semester	*Credits*
MAE 356 Aerodynamics II	4
MAE 365 Air-Breathing Propulsion Systems	4

MAE 361	Aerospace Vehicle Performance	3
	Either	
EE 201	Electric Circuits I	
	Or	
EE 331	Principles of Electrical Engineering	
	And	
EE 339	Principles of Electrical Engineering Laboratory	4
	Humanities, Social Sciences*	
	Or	
	Free Elective	3
		17

MAE 371	Aerospace Vehicle Structures I	3
EE 332	Principles of Electrical Engineering	3
EE 333	Principles of Electrical Engineering Laboratory	1
	Humanities, Social Sciences*	
	Or	
	Free Elective	3
		18

SENIOR YEAR

Fall Semester		*Credits*
MAE 462	Flight Vehicle Stability and Control	3
MAE 467	Rocket Propulsion	3
MAE 472	Aerospace Vehicle Structures II	4
	Humanities, Social Sciences*	
	or	
	Free Elective	6
		16

Spring Semester		*Credits*
MAE 479	Aerospace Vehicle Design	4
	Departmental Elective	3
	Humanities, Social Sciences*	
	or	
	Free Elective	9
		16
	Total Hours for Graduation	129

* See pages 112-115 for information concerning the humanities, or social science sequence.

Nuclear Engineering

Burlington Engineering Laboratories

Professor T. S. Elleman, *Head of the Department*

Professors: J. R. Beeler Jr, R. P. Gardner, R. L. Murray, R. F. Saxe, L. R. Zumwalt; *Associate Professors:* J. R. Bohannon Jr., C. E. Siewert, E. Stam, K. Verghese; *Extension Specialist:* J. Kohl; *Health Physicist:* R. D. Cross; *Reactor Engineer:* F. J. Steinkruger

Nuclear engineering is concerned with the engineering aspects of the control, release and utilization of nuclear energy. Nuclear reactors serve many functions—they serve as heat sources for economical electric power plants, are the basis of modern propulsion systems for ships and submarines, and produce fissionable and radioactive isotopes for a variety of peaceful applications. Nuclear methods are applied in medical diagnosis and treatment, scientific research, and the search for new resources. The nuclear engineering program educates individuals in scientific and engineering principles essential for effective and productive contributions in industrial, university, and government service.

CURRICULUM

Nuclear engineers work in nuclear systems research, design, development, testing, operation, environmental protection, and marketing. The Bachelor of Science program prepares graduates for positions in industry or government laboratories or for gradutate study (see pages 12-14). The curriculum incorporates basic sciences and engineering, with emphasis on mathematics and physics, followed by coursework in nuclear science and technology. Attention is given to the engineering design of nuclear reactors and nuclear radiation systems and to energy resources and environmental aspects of nuclear energy.

Facilities for nuclear education include: a one-megawatt pulsing reactor (PULSTAR), which can be operated at a steady state of 1 MW or pulsed to 2200 MW; a

cobalt-60 gamma source, 20,000 curies; solid state detectors and multi-channel analyzers for gamma-ray analysis; analog computers; digital computer, IBM System/360, Model 75; activation analysis laboratory; and high- and low-level radiochemistry laboratories.

OPPORTUNITIES

Although the nuclear industry is relatively young, it already represents a major national effort. Reactor development and construction will continue to grow as we become increasingly reliant upon nuclear energy as a substitute for energy from fossil fuels. Industrial applications of radiation will accelerate as the economic potential of such methods becomes even more firmly established. There continues to be a substantial need for nuclear engineers, especially by electric utilities, reactor manufacturers, and regulatory agencies.

NUCLEAR ENGINEERING CURRICULUM

For the freshman year see page 115.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 111 Algorithmic Languages I	2	ESM 200 Introduction to Mechanics	3
Humanities and Social Sciences*	3	Humanities and Social Sciences*	3
MA 202 Analytic Geometry and Calculus III	4	MA 301 Applied Differential Equations I	3
MAT 201 Structure and Properties of Engineering Materials	3	NE 201 Applications of Nuclear Energy	3
PY 202 General Physics	4	PY 203 General Physics	4
Physical Education	1	Physical Education	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EE 331 Principles of Electrical Engineering	3	EE 332 Principles of Electrical Engineering	3
ESM 303 Fluid Mechanics I	3	Humanities and Social Sciences*	3
MAE 301 Engineering Thermodynamics I	3	MA 401 Applied Differential Equations II	3
PY 410 Introductory Nuclear Physics	4	MAE 303 Engineering Thermodynamics III	3
Free Elective	3	NE 302 Fundamentals of Nuclear Engineering	4
	16		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Humanities and Social Sciences*	3	Advised Nuclear Engineering Electives	6
NE 401 Reactor Analysis and Design	4	Humanities and Social Sciences*	3
NE 402 Reactor Engineering	4	NE 403 Nuclear Engineering Design Projects	2
Advised Technical Elective	3	Free Elective	3
Free Elective	3		
	17		14

Hours Required for Graduation 129

* Humanities and social sciences sequence to be taken according to standard pattern for School of Engineering.

Professional Program in Engineering

The School of Engineering offers professional curricula leading to the degrees Chemical Engineer, Civil Engineer, Electrical Engineer, Industrial Engineer,

Materials Engineer, Mechanical Engineer and Nuclear Engineer. A program of study is designed to fit the particular needs of each student.

Professional course work is emphasized rather than research. The curriculum consists of a minimum of 30 credits making up a planned program designed to fit the student's objective.

ADMISSION

Applicants who hold the bachelor's degree in engineering will be admitted to the professional program of the School of Engineering upon presentation of official credentials. For unconditional admission, these credentials must show the completion, with a minimum grade-point average of 2.5 (C +), of an amount of undergraduate work in the proposed field of professional study corresponding to that normally required for a bachelor's degree in that field.

Admission on a provisional basis may be granted applicants who do not meet the formal requirements. In case of insufficient preparation, prerequisite courses will be prescribed in addition to the normal program requirements.

Application should be filed in the office of the dean of the School of Engineering at least 30 days in advance of the semester in which admission is sought.

GENERAL REGULATIONS

The following regulations of the School of Engineering will be observed:

1) An undergraduate enrolled at North Carolina State University who plans to undertake a professional program and who has fulfilled all requirements for the bachelor's degree except for a few courses, may be permitted to enroll in courses for credit toward the professional degree provided the student has given notice of his purpose to the dean of the School of Engineering.

2) A limited amount of credit to be applied toward the requirements for the professional degree may be transferred to N. C. State from other institutions offering advanced work in engineering. Transfer of credit must be recommended by the head of the department in which the student does his major work and approved by the Dean of Engineering.

3) Professional students are classified as post-baccalaureate students and are subject to rules and regulations established by the Dean of Engineering.

4) Grades for completed courses are reported to the Dean of Engineering and to Registration and Records. A minimum grade of "C" must be made in each course to obtain credit. A quality point average of 2.5 (C +) in all course work must be attained to satisfy requirements for a professional degree.

5) Work completed more than six years prior to the date on which the professional degree is to be granted may not be used as credit toward the professional degree, unless approved by the head of the department concerned and the Dean of Engineering.

6) Each professional student will be assigned an adviser in his or her major area. The adviser assists the student in preparing a program of study and counsels him or her in academic work. The student is required to prepare with adviser's assistance, a complete plan of study before the end of the first semester in residence. This program of study is subject to approval by the Dean of Engineering.

FOREST RESOURCES

Biltmore Hall

E. L. Ellwood, *Dean*

L. C. Saylor, *Associate Dean*

The management and utilization of the South's forest resources and products provide opportunities for challenging professional careers. Forests provide a variety of goods—timber, water, wildlife and recreation environments—vital to the economy and well being of North Carolina. Graduates of the School are qualified for professional positions managing forest lands, or producing the products or managing the services developed from these lands. Emphasis is placed on natural renewable resource management because the wise use of the products and amenities that can be derived from forest lands is central to preserving environmental quality and the quality of life.

North Carolina is an important forest state. Its 20 million acres of commercial forest land, comprising two-thirds of the State's land area, form the base for goods and services valued at approximately five billion dollars annually. Nearly 20 percent of the state's industrial labor force is associated with forest based organizations; forests support the southern region's largest industry. New wood-using industries continue to move into the South, creating multi-billion dollar outputs. Similarly, recreational activities continue to expand as a result of growing population, affluence, mobility and leisure time.

As a result of this growth, forest based industries and governmental agencies need well-educated, technically competent personnel.

Some of the programs in the School of Forest Resources are not duplicated in other Southern Universities, so the Trustees of the University and the Southern Regional Education Board have designated them as regional in nature. As a result no limit is set for enrollments of qualified out-of-state students.

DEGREES

The Bachelor of Science degree is conferred upon the satisfactory completion of any of the four-year undergraduate curricula listed below.

Graduate degrees offered include: Master of Science, Master of Forestry, Master of Recreation Resources, Master of Wood and Paper Science and the Doctor of Philosophy. Applicants should consult the Graduate Catalog for additional information.

CURRICULA

Six curricula are administered in the School through its Departments of Forestry, Recreation Resources Administration and Wood and Paper Science. These programs provide a broad education in the biological and physical sciences as well as a sound cultural background. Students are prepared for careers in the professional fields of conservation, forestry, natural resource recreation management, recreation and park administration, pulp and paper science and technology, and wood science and technology.

Freshmen have a nearly common core of courses during the first semester allowing deferment of the final selection of a curriculum for two or three semesters. An introductory course given during the first semester describes all curricula and career opportunities within the School.

FIELD INSTRUCTION AND EXPERIENCE

All students (except those in conservation) are required to present an equivalent of one summer of acceptable work experience. Students consult with their advisers as to what constitutes acceptable employment.

The sophomore summer camp is required for forestry students. This camp follows the sophomore year for resident students. Transfer students attend the camp after completing the junior year at North Carolina State University.

Undergraduates enrolled in recreation resources administration complete a nine-weeks internship immediately following the completion of the junior year.

Wood science and technology students attend a summer practicum following the sophomore year; transfer students attend following the junior year.

Additional field instruction and scheduled trips to representative industries and agencies are required frequently as a part of regular class assignments.

HONORS PROGRAM

Students making exceptional academic records during their freshman year may, with faculty approval, follow an honors program. Honors students develop more rigorous programs of study, frequently taking advanced courses in mathematics, chemistry, statistics and economics. With the adviser's consent honors students may substitute preferred courses for normally required courses in order to develop strength in special interest areas. Junior and senior honors students are encouraged to undertake a special program of independent study which can involve a research problem.

EXTENSION

The Forestry Extension program, a part of the Agricultural Extension Service, is the largest program of its type in the United States. It serves landowners, industries and public agencies in the areas of forestry, recreation, wildlife and wood and paper. Its primary responsibility is promoting the application of new ideas developed through research and experience.

In cooperation with the Continuing Education Division, short courses are offered in a number of fields to provide industry and government employees an opportunity to keep abreast of modern developments in techniques and equipment.

FACILITIES AND LABORATORIES

A school library and most classrooms are housed in Biltmore Hall. Among special education facilities in Forest Resources are: 80,000 acres in forests including the Hofmann forest on the coastal plain and the Hill, Schenck, Hope Valley and Goodwin Forests in the Piedmont; and the Slocum summer camp for sophomores in Hill Forest, Durham county. Specialized laboratories unique to the South are the Hodges Wood Products Laboratory housing machining, gluing, finishing, preserving, testing and research laboratories, a sawmill, a dry kiln and a veneer lathe; and the Robertson Laboratory with wood preparation, chemistry, pulping, testing and coloring laboratories, digesters and a small paper machine.

Conservation

(Also see Agriculture and Life Sciences.)

M. G. Cook, *Major Adviser, School of Agriculture and Life Sciences*

L. C. Saylor, *Major Adviser, School of Forest Resources*

Conservation is wise use, perpetuation, or improvement of natural resources for the long-term benefit of society. Rapid urbanization and industrialization, and increasing population, are increasing pressures on the use of land areas for food and fiber, for wood and water and for recreation. These trends require trained people to make sound judgments in natural resources management and use.

The Schools of Forest Resources and Agriculture and Life Sciences—with strong programs in forestry, recreation, wood and paper science, ecology, soils, wildlife and the basic biological sciences—jointly offer a baccalaureate program in conservation. Conservation graduates are trained in the basic concepts of several disciplines to apply a conservation philosophy to problem-solving in a modern society.

CURRICULUM

Depending upon interests, students enroll in either Forest Resources or Agriculture and Life Sciences. All programs in conservation have common core courses; specialty areas or minors are developed through elective courses.

Conservation provides a broad general education in natural resource management leading to a Bachelor of Science degree, rather than emphasizing technological aspects. Students desiring a more professional emphasis frequently combine the conservation program with a second degree. By the proper choice of electives, one may obtain a dual degree in fields such as botany, forestry, liberal arts, recreation, soil science, wildlife management and zoology.

CONSERVATION CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ALS 103 Introductory Topics in ALS		CH 101 General Chemistry I	4
or		ENG 112 Composition & Reading	3
FOR (WPS) 101 Introduction to Forest Resources	1	Humanity-Social Science Elective	3
BO 200 Plant Life		MA 112 Analytic Geometry & Calculus A	4
or		Physical Education	1
BS 100 General Biology	4		15
ENG 111 Composition & Rhetoric	3		
Humanity-Social Science Elective	3		
MA 111 Algebra & Trigonometry	4		
Physical Education	1		
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 103 General Chemistry II	4	BO 200 Plant Life	
or		or	
CH 107 Principles of Chemistry		ZO 201 Animal Life	4
GY 120 Physical Geology	2	English Elective	3
GY 110 Physical Geology Laboratory	1	Free Elective	4
Humanity-Social Science Electives	6	SSC 200 Soil Science*	4
ZO 221 Conservation of Natural Resources	3	Physical Education	1
Physical Education	1		16
	17		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BO (ZO) 360 Introduction to Ecology	4	Biological Science Elective	3
Conservation Elective	3	Conservation Elective	3
RRA 241 Recreation Resource Relationships	3	Humanity-Social Science Elective	3
Humanity-Social Science Elective	3	PY 221 College Physics	5
ST 311 Introduction to Statistics	3	FOR 472 Renewable Resource Management	3
	16		17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Biological Science Elective	3	Biological Science Elective	3
Conservation Elective	3	Conservation Elective	3

English Elective	3	Humanity-Social Science Elective	3
ZO 353 Wildlife Management	3	Free Electives	6
Free Electives	4		15
	16	Total Hours for Graduation	128

* Students with non-technical interests may substitute SSC 205 for SSC 200.

Elective courses may be used for emphasizing subject areas in communication, soils, wildlife biology, education and other areas.

Forestry

Biltmore Hall

Professor C. B. Davey, *Head of Department*

TEACHING AND RESEARCH

Professors: F. S. Barkalow Jr., R. C. Bryant, A. W. Cooper, E. B. Cowling, J. W. Duffield, M. H. Farrier, J. W. Hardin, C. S. Hodges Jr. (USFS), J. O. Lammi, T. E. Maki, G. Namkoong (USFS), T. O. Perry, L. C. Saylor, R. R. Wilkinson, B. J. Zobel; *Adjunct Professors:* G. H. Hepting, N. E. Johnson, L. J. Metz, C. G. Wells; *Professors Emeriti:* W. D. Miller, R. J. Preston; *Associate Professors:* L. F. Grand, W. L. Hafley, D. H. J. Steensen, B. F. Swindel (USFS), A. G. Wollum II; *Adjunct Associate Professors:* W. T. Gladstone, J. W. Koenigs, E. G. Kuhlman; *Assistant Professors:* L. G. Jervis, R. C. Kellison; *Adjunct Assistant Professors:* R. L. Blair, H T. Schreuder; *Liaison Geneticists:* J. B. Jett Jr., R. J. Weir; *Teaching Technician:* T. V. Gemmer; *Research Associates:* F. P. Hain, L. W. Haines; *Research Assistants:* W. D. Pepper (USFS), J. R. Sprague

EXTENSION

Professor W. M. Keller, *In Charge of Forest Resources Extension*

Professors: J. C. Jones, F. E. Whitfield; *Associate Professors:* R. S. Douglass, W. T. Huxster Jr.; *Leader, Forestry Section,* E. M. Jones; *Assistant Professor:* W. M. Stanton; *Instructor:* A. J. Weber; *Specialist:* L. H. Harkins

CURRICULUM

The forestry curriculum provides a general education and training in management of forest land resources. This curriculum requires knowledge of: basic surveying and use of aerial photographs to prepare maps; biology to identify plants and animals and to control their growth and reproduction; mathematics and biometry to sample and estimate timber and other resources of the forest; and economics and business management to evaluate and handle forest properties and business enterprises.

The broad forestry curriculum emphasizes a solid background in chemistry, physics, mathematics, biology, and humanities and social science. It provides a core of general forestry, including a 10-week summer camp program immediately following the sophomore academic year. In the junior and senior years, courses deal directly with forest growth, forest land management and economic use of forest resources. By the beginning of the junior year, the student chooses an area of specialization and selects appropriate courses for that concentration. Three months of acceptable work experience are required for graduation with a Bachelor of Science degree in forestry.

OPPORTUNITIES

Graduates are in demand by state and federal land-managing agencies, by industrial concerns growing wood as a raw material, and by other organizations and

agencies such as the agricultural extension service. Some graduates, after acquiring professional foresty experience, are self-employed as consultants and as operators or owners of forest-related businesses.

FORESTRY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BO 200 Plant Life	4	CH 103 General Chemistry II**	4
CH 101 General Chemistry I*	4	ENG 112 Composition & Reading	3
ENG 111 Composition & Rhetoric	3	FOR 210 Dendrology-Gymnosperms	2
FOR (WPS) 101 Introduction to Forest Resources	1	Humanity-Social Science Elective***	3
MA 112 Analytic Geometry & Calculus A*	4	MA 212 Analytic Geometry & Calculus B	3
Physical Education	1	Physical Education	1
	17		16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
English-Speech Elective	3	SSC 200 Soil Science	4
FOR 211 Dendrology-Angiosperms	2	FOR 272 Forest Mensuration	3
EC 212 Economics of Agriculture	3	PY 221 College Physics	5
WPS 202 Wood Structure & Properties I	3	Free Elective	3
Free Elective	3	Physical Education	1
Physical Education	1		16
	15		

SUMMER CAMP

	Credits
FOR 204 Silviculture	2
FOR 263 Dendrology	1
FOR 264 Forest Protection	2
FOR 274 Mapping & Mensuration	4
FOR 284 Utilization	1
	10

All students select a concentration by the beginning of the junior year at the latest.

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENT 301 Introduction to Forest Insects	3	FOR 452 Silvics	4
ST 311 Introduction to Statistics	3	Humanity-Social Sciences Electives***	6
FOR (WPS) 219 Forest Economy and Its Operation	3	Concentration Requirements	3
Humanity-Social Science Elective***	3	PP (FOR) 318 Forest Pathology	4
Concentration Requirements	4		17
	16		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
FOR 405 Forest Land Management	5	FOR 406 Forest Land Inventory and Planning	6
Concentration Requirements	8	Concentration Requirements	10
Free Electives***	3		16
	16		

Total Hours for Graduation 139

* The freshman year course offerings as shown here assume that entrance test scores suggest readiness for MA 112 and CH 101. Appropriate substitutions will be made when test scores indicate the need to start at a different level.

** Students planning to take full-year courses in advanced chemistry will take CH 107 in place of CH 103.

*** Elective must include at least 12 credits in humanities or social science; nine credits are completely free of restriction.

FORESTRY FIELDS OF SPECIALIZATION

The concentrations in forestry include a) general forestry, b) business operations, c) forest biometry, d) watershed management, e) forest biology, f) wildlife management, g) harvesting operations, h) recreation, i) conservation and j) wood technology. A student selects a concentration and schedules appropriate approved courses.

DUAL DEGREE PROGRAMS

Programs have been arranged with economics and business, entomology, recreation resources administration, soil science, and zoology, whereby students can obtain, in addition to the Bachelor of Science degree in forestry, a second Bachelor of Science degree in agricultural economics, conservation, entomology, natural resource recreation management, soil science or wildlife management. These joint programs usually require additional credits above the forestry concentration and free elective credits. Depending upon ability, students may carry additional credits in their four-year program or by enrolling for an extra semester or equivalent summer session.

Recreation Resources Administration

Biltmore Hall

Professor T. I. Hines, *Head of the Department*

Professors: W. E. Smith, R. E. Sternloff; *Associate Professors:* L. L. Miller, M. R. Warren Jr.; *Adjunct Associate Professor:* J. S. Stevens Jr.; *Associate Professors Emeriti:* G. A. Hammon, C. C. Stott; *Assistant Professors:* H. K. Cordell, D. L. Erickson, P. K. McKnelly; *Adjunct Assistant Professors:* J. H. Brendle Jr., J. H. Moses; *Adjunct Instructors:* R. L. Buckner, W. C. Singletary Jr.

Standards adopted by the recreation profession make college graduation a requirement for professional recreation employment. North Carolina State University has facilities, staff, curriculum, program and an established reputation for comprehensive professional education in recreation and parks education.

The curricula of the Department of Recreation Resources Administration offer a broad general education background, basic professional and technical courses, and the opportunity to specialize in a particular field of recreation. Two curricula leading to a Bachelor of Science degree are available: recreation and park administration and natural resource recreation management.

RECREATION AND PARK ADMINISTRATION CURRICULUM

The recreation and park administration curriculum fulfills the needs of the graduate who will be employed by municipalities, governmental agencies, private agencies, industry and business and other private groups. General education courses are in biology, psychology, history and government, English, mathematics, chemistry and economics. Specialized courses are in accounting, statistics, research methods, landscape gardening and design. Professional courses, applying directly to the needs of the recreator and his profession, cover recreation philosophy, management techniques and skills, fiscal operation, supervision, site planning, programming, administration, etc.

A student may study the application of recreation to a particular environment by following these concentrations:

Employee Concentration—A background in economics, personnel management and industrial psychology is necessary.

Municipal Parks—Additional courses in applied biology, municipal government and community organization are required.

Institutional—Youth service agencies, corrective institutions and private agencies require that a graduate have emphasis in sociology and psychology.

Public—To satisfy the needs of students planning to be employed by municipalities or counties, additional courses are required in government, community organization and leadership.

RECREATION AND PARK ADMINISTRATION CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 General Biology	4	EC 201 Economics I	3
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
FOR (WPS) 101 Introduction to Forest Resources	1	SOC 202 Principles of Sociology	3
MA 112 Analytic Geometry & Calculus A or		BO 200 Plant Life or	
MA 122 Mathematics of Finance & Elementary Statistics	4	ZO 201 Animal Life	4
RRA 152 Introduction to Recreation	3	Physical Education	1
Physical Education	1	Electives	3
	16		17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
RRA 215 Maintenance & Operations I	3	CH 111 Foundations of Chemistry	4
RRA 241 Recreation Resource Relationships	3	FOR (WPS) 273 Quantitative Methods in Forest Resources	3
Social Science-Humanity Elective	3	Physical Science Elective	3
Speech Elective	3	RRA 216 Maintenance & Operations II	3
ZO 221 Conservation of Natural Resources	3	Social Science-Humanity Elective	3
Physical Education	1	Physical Education	1
	16		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
HS 342 Landscape Horticulture	3	ACC 260 Accounting I—Concepts of Financial Reporting	3
LAR 211 Introduction to Landscape Architecture	3	RRA 359 Recreation & Park Supervision	3
RRA 358 The Recreation Program	4	ST 311 Introduction to Statistics	3
Social Science-Humanity Elective	3	Concentration Elective	3
Sociology Elective	3	Elective	3
	16		15

SUMMER SESSION
(9 weeks)

RRA 475 Recreation and Park Internship 9

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BO (ZO) 360 Introduction to Ecology	4	RRA 451 Facility & Site Planning	3
RRA 453 Administrative Policies & Procedures	3	RRA 454 Recreation & Park Finance	3
SOC 416 Research Methods	3	Concentration Elective	3
Concentration Elective	3	Elective	3
Elective	3	Social Science-Humanity Elective	3
	16		15
		Total Hours for Graduation	137

NATURAL RESOURCE RECREATION MANAGEMENT CURRICULUM

Increases in natural resource-oriented recreation is evident throughout the nation. Highly motivated professionals with strong interdisciplinary backgrounds, trained to understand people's recreation wants and needs, and competent to make sound

judgments in planning and managing renewable natural resources for the optimum output of recreation benefits are needed.

This curriculum provides professional competence in natural resource recreation management for employees of organizations, institutions, agencies or corporations concerned with the preservation, wise use and improvement of recreation resources and opportunities as they occur in the general forest environment. Graduates can serve with public or private agencies primarily with the more intensive phases of public outdoor recreation as they occur on extensive parklands and on other nonurban lands managed for the optimum output of diversified recreation opportunities.

NATURAL RESOURCE RECREATION MANAGEMENT CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 General Biology	4	EC 201 Economics I	3
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
FOR (WPS) 101 Introduction to Forest Resources	1	MA 212 Analytic Geometry & Calculus B	3
MA 112 Analytic Geometry & Calculus A	4	ZO 201 Animal Life or	
RRA 152 Introduction to Recreation	3	BO 200 Plant Life	4
Physical Education	1	SOC 202 Principles of Sociology	3
		Physical Education	1
	16		17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II	4
RRA 241 Recreation Resource Relationships	3	English Literature Elective	3
ZO 221 Conservation of Natural Resources*	3	Social Science-Humanity Elective	3
FOR (WPS) 273 Quantitative Methods in Forest Resources	3	PY 221 College Physics	5
Social Science-Humanity Elective	3	Physical Education	1
Physical Education	1		16
	17		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
RRA 440 Recreation Resource Inventory and Planning	3	RRA 441 Recreation Resources Development	3
BO (ZO) 360 Introduction to Ecology	4	BO 403 Systematic Botany or	
ST 311 Introduction to Statistics	3	FOR 210 & 211 Dendrology, Gymnosperms, Angiosperms**	4
Controlled Elective	6	SSC 200 Soil Science	4
	16	Controlled Elective	3
		Elective	3
			17

SUMMER SESSION

RRA 475 Recreation & Park Internship 9

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
RRA 442 Wildland Recreation Environments	3	RRA 454 Recreation & Park Finance	3
Controlled Elective	6	Controlled Electives	6
Social Science-Humanity Elective	3	Electives	6
Elective	3		15
	15	Total Hours for Graduation	138

* Students of junior standing may elect FOR 472, Renewable Resource Management.
** FOR 210 and 211 may not be taken in the same semester.

Wood and Paper Science

Biltmore Hall

Professor I. S. Goldstein, *Head of the Department*

TEACHING AND RESEARCH

Professors: R. M. Carter, E. B. Cowling, E. L. Ellwood, C. A. Hart, R. G. Hitchings, R. J. Thomas; *Adjunct Professors:* P. Koch, W. R. Smith; *Professor Emeritus:* A. J. Stamm; *Associate Professors:* H. Chang, R. C. Gilmore, J. S. Gratzl, W. T. McKean Jr., R. G. Pearson, R. H. Reeves, C. N. Rogers, D. H. J. Steensen; *Adjunct Associate Professors:* K. P. Kringstad, R. K. Stevens; *Associate Professor Emeritus:* C. G. Landes; *Assistant Professor:* M. W. Kelly; *Assistant Professor Emeritus:* H. D. Cook; *Teaching Technician:* T. Gemmer; *Associate Members of the Faculty:* V. T. Stannett (Chemical Engineering), A. Prak (Industrial Engineering)

EXTENSION

Professor: A. C. Barefoot Jr., *Leader, Wood Products Section; Associate Professor:* M. P. Levi; *Associate Professor Emeritus:* L. H. Hobbs; *Instructors:* E. L. Deal Jr., S. J. Hanover; *Specialist:* R. C. Allison

The wood industries have been a vital part of North Carolina's economy for over 300 years. North Carolina ranks high in the manufacture of hardwood, plywood, and wooden furniture, rough lumber and railroad tie production and the manufacture of pulp and paper. The value of forest products produced annually in the state exceeds three billion dollars. Seventeen percent of the state's labor force is employed in the wood industries.

The Department of Wood and Paper Science offers two curricula leading to Bachelor of Science degrees—wood science and technology and pulp and paper science and technology—to educate persons for careers in the wood based and allied industries or in government agencies concerned with wood resources. Wood science and technology is concerned with the technical aspects of wood and its processing into reconstituted and manufactured products. Pulp and paper science and technology deals specifically with wood fibers and their processing for paper and wood based chemicals.

PULP AND PAPER SCIENCE AND TECHNOLOGY

Robertson Laboratory

Professor R. G. Hitchings, *In Charge*

This curriculum prepares people for technical work in the rapidly growing pulp and paper industry which ranks fifth among all American industries. This is primarily a Southern industry with over 60 percent of the nation's pulpwood produced in the South. Careers include process engineers, product development engineers, technical service engineers, quality control supervisors, process control chemists and production supervisors. After basic science courses, the students study in the specialized Robertson Pulp and Paper Laboratory in wood pulp processes, chemical and by-products recovery, pulp bleaching, and in the various papermaking operations, such as refining, sizing, filling, dyeing, formation, coating and the converting of paper.

Pulp and paper is a regional program approved by the Southern Regional Education Board as the undergraduate program to serve the Southeast in this field. Approximately 70 undergraduate scholarships are granted annually to students by more than 90 company members composing the Pulp and Paper Foundation.

All pulp and paper majors spend at least one summer working in a pulp or paper mill designated by the University. One hour of academic credit is granted after completion of 12 weeks of mill work and presentation of a satisfactory report. In addition to this minimum summer work requirement, students are urged to work in mills the two other summers between academic years to gain valuable practical experience.

This curriculum leads to a Bachelor of Science in pulp and paper science and technology. Three programs are available emphasizing the technological, engineering or scientific aspects of pulping and papermaking. The technology program provides a broad background for those students anticipating careers in mill operations or with paper industry supplier organizations. Greater depth in the underlying scientific principles or their applications can be obtained from the science and engineering programs, which also provide a good foundation for graduate study. A fifth year program leading to a second degree, a Bachelor of Science in Chemical Engineering, is available.

PULP AND PAPER SCIENCE AND TECHNOLOGY CURRICULUM

TECHNOLOGY PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
ENG 111 Composition and Rhetoric	3	ENG 112 Composition & Reading	3
MA 112 Analytic Geometry & Calculus A*	4	WPS 242 Fiber Analysis	3
WPS (FOR) 101 Introduction to Forest Resources	1	MA 212 Analytic Geometry & Calculus B*	3
Social Science-Humanity Elective**	3	E 101 Engineering Graphics I	2
Physical Education	1	Physical Education	1
	16		16

* Honors students take MA 102, 201 and 202
** Basic economics course recommended

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 220 Introductory Organic Chemistry	4	CH 315 Quantitative Analysis	4
PY 211 General Physics*	4	PY 212 General Physics*	4
ST 361 Introduction to Statistics for Engineers	3	WPS (FOR) 273 Quantitative Methods in Forest Resources	3
Physical Education	1	Social Science-Humanity Elective	3
Social Science-Humanity Elective	3	Physical Education	1
Free Elective	3		15
	18		

* Honors students take PY 205, 208

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 331 Introductory Physical Chemistry	4	Engineering Elective*	3
CHE 301 Elements of Chemical Engineering	3	CHE 302 Elements of Chemical Engineering	3
WPS 211 Pulp & Paper Internship	1	WPS 322 Pulp & Paper Technology II	3
WPS 321 Pulp & Paper Technology I	3	WPS 332 Wood & Pulping Chemistry	4
WPS 331 Introduction to Wood and Pulping Chemistry	1	Free Elective	3
MAE 307 Energy & Energy Transformations	3		16
Social Science-Humanity Elective	3		
	18		

* EE 331, 350, IE 301 or CHE 225

SENIOR YEAR

Fall Semester	*Credits*
WPS 471 Pulping Process Analysis	3
WPS 411 Pulp/Paper Unit Processes	3
WPS 491 Senior Problems in Wood & Paper Science	1
Social Science-Humanity Elective	3
WPS 413 Paper Properties & Additives	3
Technical Elective	3
	16

Spring Semester	*Credits*
WPS 403 Paper Process Analysis	3
WPS 412 Pulp & Paper Unit Processes II	3
WPS 463 Plant Inspections	1
Social Science-Humanity Elective	3
Free Elective	3
Technical Elective	3
	16

Total Hours for Graduation 131

PULP AND PAPER SCIENCE AND TECHOLOGY CURRICULUM

SCIENCE PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*
ENG 111 Composition & Rhetoric	3
CH 101 General Chemistry I	4
MA 102 Analytic Geometry & Calculus I	4
WPS (FOR) 101 Introduction to Forest Resources	1
Social Science-Humanity Elective*	3
Physical Education	1
	16

Spring Semester	*Credits*
ENG 112 Composition & Reading	3
CH 107 Principles of Chemistry	4
MA 201 Analytic Geometry & Calculus II	4
E 101 Engineering Graphics I	2
WPS 242 Fiber Analysis	3
Physical Education	1
	17

* Basic economics course recommended

SOPHOMORE YEAR

Fall Semester	*Credits*
CH 221 Organic Chemistry I	4
MA 202 Analytic Geometry & Calculus III	4
PY 205 General Physics	4
Social Science-Humanity Elective	3
Physical Education	1
	16

Spring Semester	*Credits*
CH 223 Organic Chemistry II	4
MA 301 Applied Differential Equations I	3
PY 208 General Physics	4
Free Elective	3
Physical Education	1
	15

JUNIOR YEAR

Fall Semester	*Credits*
CH 431 Physical Chemistry I	3
CH 432 Physical Chemistry I Laboratory	1
WPS 211 Pulp and Paper Internship	1
WPS 321 Pulp and Paper Technology I	3
ST 361 Introduction to Statistics for Engineers	3
CH 315 Quantitative Analysis	4
Free Elective	3
	18

Spring Semester	*Credits*
CH 433 Physical Chemistry II	3
WPS 322 Pulp and Paper Technology II	3
WPS 332 Wood & Pulping Chemistry	4
Social Science-Humanity Elective	3
Technical Electives	4
	17

SENIOR YEAR

Fall Semester	*Credits*
WPS 471 Pulping Process Analysis	3
WPS 491 Senior Problems in Wood & Paper Science	1
WPS 413 Paper Properties and Additives	3
Social Science-Humanity Electives	6
Technical Elective	3
	16

Spring Semester	*Credits*
WPS 403 Paper Process Analysis	3
WPS 463 Plant Inspections	1
Free Elective	3
Social Science-Humanity Elective	3
Technical Electives	6
	16

Total Hours for Graduation 131

PULP AND PAPER SCIENCE AND TECHNOLOGY CURRICULUM

CHEMICAL ENGINEERING PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 112H Composition and Reading*	3	E 101 Engineering Graphics I	2
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
WPS (FOR) 101 Introduction to Forest Resources	1	WPS 242 Fiber Analysis	3
MA 102 Analytic Geometry & Calculus I	4	MA 201 Analytic Geometry & Calculus II	4
Social Science-Humanity Elective	3	CSC 111 Algorithmic Languages I	2
Physical Education	1	Physical Education	1
	16		16

* If not qualified, take ENG 111 and 112

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
PY 205 General Physics	4	MA 301 Applied Differential Equations I	3
MA 202 Analytic Geometry & Calculus III	4	CHE 225 Chemical Process Systems	3
CHE 205 Chemical Processes Principles	3	PY 208 General Physics	4
Physical Education	1	Free Elective	3
	16	Physical Education	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
WPS 211 Pulp & Paper Internship	1	WPS 322 Pulp and Paper Technology II	3
WPS 321 Pulp & Paper Technology I	3	CHE 315 Chemical Process Thermodynamics	3
CH 431 Physical Chemistry I	3	CHE 327 Separation Processes I	3
CH 432 Physical Chemistry I Laboratory	1	WPS 332 Wood and Pulping Chemistry	4
CHE 311 Transport Processes I	3	Social Science-Humanity Elective	3
Social Science-Humanity Elective	3		16
Free Elective	3		
	17		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
WPS 471 Pulping Process Analysis	3	WPS 403 Paper Process Analysis	3
WPS 411 Pulp & Paper Unit Processes I	3	WPS 412 Pulp & Paper Unit Processes II	3
WPS 491 Senior Problems in Wood & Paper Science	1	WPS 463 Plant Inspections	1
WPS 413 Paper Properties and Additives	3	Technical Elective	3
Social Science-Humanity Electives	6	Social Science-Humanity Elective	3
	16	Free Elective	3
			16
		Total Hours for Graduation	131

WOOD SCIENCE AND TECHNOLOGY

Professor R. M. Carter, *In Charge*

Wood science and technology is an applied science of an inter-disciplinary nature utilizing the natural sciences, mathematics, engineering and economics to understand wood and its processing. It is a materials science, but also involves industrial manufacturing and management. The wood technologist's job is related to engineering; but, unlike the engineer, one's educational exposure to wood science makes one capable of applying knowledge in such wood processes as machining, seasoning, gluing and finishing.

CURRICULUM

Students study nature of wood as a natural resource and its processing by means of a systematic study of the properties of wood and the processes involved in its utilization and manufacture.

The curriculum's flexibility enables students to specialize in areas of interest as they apply to the wood science and technology field. Sound mathematics and natural

science background allows a materials science approach to wood to develop concurrently with training in the processing technology of wood and wood based products and in decision making applied to wood product manufacturing.

After the sophomore year students attend a six-week wood process laboratory practicum in the Brandon P. Hodges Wood Products Laboratory. Students then intern in industry or in institutional research.

During the program's final two years, students choose a concentration in another discipline outside of the department.

OPPORTUNITIES

The wood technologist's scientific engineering, industrial knowledge and specialty in the properties and behavior of wood qualify him or her for positions in today's modern wood manufacturing industries.

Careers include industrial positions with companies manufacturing lumber, veneer, plywood, particle and fiber boards and consumer wood products such as furniture. Wood technologists are also in demand by suppliers to wood manufacturing industries, such as chemical and machinery companies. Policy making opportunities are available with state and federal government in research, marketing or extension activities.

Wood is a renewable biological resource requiring less energy for processing than other materials. Therefore, the wood technologist can help improve the environment by developing cleaner processes, working with a renewable resource and creating policies governing environmental development.

WOOD SCIENCE AND TECHNOLOGY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 112 Analytic Geometry & Calculus A*	4	MA 212 Analytic Geometry & Calculus B*	3
CH 101 General Chemistry I	4	CH 103 General Chemistry II	4
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
WPS (FOR) 101 Introduction to Forest Resources	1	BS 100 General Biology or BO 200 Plant Life	4
Social Science-Humanity Elective	3	Physical Education	1
Physical Education	1		
	16		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EC 201 Economics I or EC 212 Economics of Agriculture	3	Social Science-Humanity Elective	3
PY 221 College Physics	5	WPS 203 Wood Structure & Properties II	3
Social Science-Humanity Elective	3	WPS 220 Wood Protection	3
WPS 202 Wood Structure & Properties I	3	Concentration Elective	3
Physical Education	1	Free Elective	3
		Physical Education	1
	15		16

SUMMER PRACTICUM

	Credits
WPS 205 Wood Products Practicum	5
WPS 210 Forest Products Internship	1
	6

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Social Science-Humanity Elective	3	Social Science-Humanity Elective	3
ST 361 Introduction to Statistics for Engineers I	3	WPS 302 Wood Processing II	3
WPS 301 Wood Processing I	3	WPS 316 Wood-Polymer Principles	3
WPS 315 Introduction to Wood-Polymer Principles	2	WPS 344 Introduction to Quality Control	3
Concentration Elective	3	WPS 491 Senior Problems in Wood & Paper Science	1
		Concentration Elective	3
	14		16

SENIOR YEAR

Fall Semester	*Credits*
Social Science-Humanity Elective	3
WPS 434 Wood Operations	3
WPS 441 Introduction to Wood Mechanics	2
WPS 491 Senior Problems in Wood & Paper Science	2
Concentration Electives	6
	16

Spring Semester	*Credits*
WPS 442 Wood Mechanics & Design	3
Concentration Electives	6
Free Electives	6
	15
Total Hours for Graduation	129

* Students with mathematical aptitude and interest are encouraged to substitute MA 102, MA 201 and MA 202 for the mathematical sequence listed.

FIELDS OF SPECIALIZATION

The program provides the opportunity to follow concentrations in a discipline outside the department to the extent of a minimum of 21 credit hours. The student may develop a second area of concentration which can be applied to the field of wood science and technology and which can also provide a base for subsequent graduate work in wood science and technology or in the concentration. Concentrations are available in: a) economics, b) quantitative analysis, c) biology and biochemistry, d) chemistry, e) harvesting operations and f) political science. Concentrations other than those listed may be arranged through the department.

DUAL DEGREE PROGRAM

A dual degree program is available with the Department of Economics and Business whereby students can obtain, in addition to a Bachelor of Science in wood science and technology, a second Bachelor of Science in economics.

Additional credits beyond those required for the single degree program are necessary. Capable students can usually obtain additional credits within the four years of the regular undergraduate program.

LIBERAL ARTS

R. O. Tilman, *Dean*

W. B. Toole III, *Associate Dean*

The School of Liberal Arts offers programs of study which lead to baccalaureate and advanced degrees in the disciplines comprising the humanities and social sciences, and also offers courses in these areas which are part of the programs of all undergraduate students in the University. In this way the University provides an opportunity for its students to prepare for a full life in professions and occupations that require intellectual flexibility, broad knowledge, and a basic comprehension of human beings and their problems.

Nine departments are included in the School of Liberal Arts: economics and business (also a department in the School of Agriculture and Life Sciences), English, history, modern languages, philosophy and religion, physical education, politics, sociology and anthropology (also a department in the School of Agriculture and Life Sciences) and speech-communication (as of July 1, 1975). Undergraduate majors are offered in economics, accounting, business management, English, history, French, Spanish, philosophy, politics, sociology, speech-communication, and multi-disciplinary studies. In some departments special concentrations are available within major programs: e.g., writing and editing (English), criminal justice (politics or sociology), and social work (sociology). And a teacher education option is available in English, speech-communication, French, Spanish, and social studies (history, economics, politics, sociology). Degrees granted include the Bachelor of Arts, the Bachelor of Science, the Master of Arts, and the Doctor of Philosophy, as well as professional degrees in economics, politics, and sociology.

In addition to the general University requirements, the student must present at least two units of a modern foreign language upon entrance. Students transferring from junior colleges are limited to 64 transfer credits plus physical education.

BACHELOR OF ARTS PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
History*	3	History	3
Mathematics**	3-4	Mathematics	3-4
Modern Language 201 (Intermediate)	3	Modern Language 202 (Intermediate)	3
Social Science***	3	Social Science	3
Physical Education	1	Physical Education	1
	16-17		16-17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Literature****	3	Literature	3
Natural Science*****	3-4	Natural Science	3-4
PHI 205 Problems & Types of Philosophy	3	Social Science	3
Social Science	3	Elective	6
Elective	3	Physical Education	1
Physical Education	1		16-17
	16-17		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Natural Science	3-4	Major	9
Major******	6	Electives	6
Electives	6		15
	15-16		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Major	9	Major	6
Electives	6	Electives	9
	15		15

Total Hours for Graduation 124

* A two-semester program including a course concerned with pre-industrial Western or non-Western societies (HI 204, 207, 208, 209, 215, 216, 263, 264 or 265), and another dealing with the United States or post-industrial Western societies (HI 205, 210, 211, 233, 241, 242, 243, 244 or 272).

** Two semesters for social science majors (MA 111-112 required for economics; MA 111-112 recommended for sociology and politics but MA 115-116 permitted). For all other Liberal Arts majors either two semesters (MA 115-116 or MA 111-112) or one semester plus a course in computer science, statistics, or logic (MA 115 or MA 111 and CSC 200, ST 311, or PHI 201).

*** Twelve hours in at least two different social sciences, including a two-semester sequence (EC 201-202; PS 201 or 202 plus any other politics course; SOC 202, ANT 252, or PSY 200 plus any other course in the same discipline). Six hours of social science must be taken in an area or areas outside of the one in which the sequence requirement is satisfied.

**** A two-semester sequence which surveys English or American literature (ENG 261-262 or ENG 265-266) or the literature of a modern foreign language (MLF 301-302; MLG 301-302; MLS 301-302; MLR 303-304).

***** A three-semester program consisting of a total of three courses from any three of the following disciplines: physics, chemistry, biological science, geoscience (geology, meteorology, oceanography). Or an equivalent program with a two-semester sequence in biological science (BS 100 or BS 105 plus another biological science), chemistry (CH 101-103) or physics (PY 231-232) and another course in natural science other than the one in which the sequence is completed.

****** Major requirements for the Bachelor of Arts range from 27 to 39 hours. Most of the major programs, however, call for 30 hours of work above the basic frehman courses in a discipline.

BACHELOR OF SCIENCE PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry or	
ENG 111 Composition & Rhetoric	3	CH 103 General Chemistry II	4
Mathematics*	4	ENG 112 Composition & Reading	3
Physical Education	1	Mathematics	3-4
Humanities/Social Science Elective**	3	Physical Education	1
	15	Humanities/Social Science Elective	3
			14-15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PHI 205 Problems & Types of Philosophy	3	Humanities/Social Science Elective	3
Mathematics	3-4	Course I—Major****	3
PY 205 or 211 General Physics	4	Mathematics	3
Physical Education	1	PY 208 or 212 General Physics	4
Modern Language/English Literature ***	3	Physical Education	1
	14-15	Modern Languages/English Literature	3
			17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 General Biology	4	Humanities/Social Science Elective	3
History or Philosophy of Science*****	3	Course IV—Major	3
Course II—Major	3	Course V—Major	3
Course III—Major	3	Advanced Technology or Science Course II	3-4
Advanced Technology or Science Course I******	3-4	Zoology 201 Animal Life or Botany 200 Plant Life	4
	16-17		16-17

SENIOR YEAR

Fall Semester	*Credits*
Course VI—Major	3
Course VII—Major	3
Advanced Technology or Science Course II	3-4
Electives	6
	15-16

Spring Semester	*Credits*
Course VIII—Major	3
Course IX (Seminar in Major)	3
Advanced Technology or Science Course IV	3-4
Electives	6
	15-16

Total Hours Required for Graduation 127

* One of the following four-course sequences: 1) MA 112, 212, 231, 232; 2) 102, 201, 202 and 231, 301, 312, 405; 3) 112, 212, 114, 214.
** Twelve hours in humanities and/or social sciences in areas outside major discipline.
*** Six hours of modern language and/or English literature at 200 level or above.
**** Twenty-seven hours are required in economics, English, history, philosophy, or politics.
***** One of the following: HI 322, HI 321, PHI 405, HI 341, or MA 433.
****** A 15-hour concentration is required in some area of science or technology.

COOPERATIVE EDUCATION IN THE B.A. AND B.S. PROGRAMS

Cooperative Education in Liberal Arts seeks to broaden the student's intellectual horizons and at the same time provide an introduction to the world of business, industry, government, or finance in preparation for a career after graduation. The freshman and senior years are usually spent on campus while the sophomore and junior years are devoted to alternate periods of on-campus study and off-campus work. The student is paid by the employer for work experiences. Ordinarily the program takes five years to complete, but students who are willing to take an average of 18 hours a semester and attend summer school can finish in four years.

Further information can be obtained from the Director of Cooperative Education in Liberal Arts (115-C Tompkins Hall).

JOINT LIBERAL ARTS-ENGINEERING PROGRAM

Some students may want to combine a Bachelor of Science in engineering with either a Bachelor of Science or Bachelor of Arts in liberal arts. When the two are carried along together, the double degree program can be completed in five years. Those interested should contact the Director of the Freshman Engineering Division and the Associate Dean of Liberal Arts.

Economics and Business

(Also see agriculture and life sciences.)

Patterson Hall

Professor W. D. Toussaint, *Head of the Department*

Professor B. M. Olsen, *Assistant Head of the Department*

TEACHING AND RESEARCH

Professors: A. J. Bartley, A. J. Coutu, E. W. Erickson, D. M. Hoover, L. A. Ihnen, G. D. Irwin (USDA), P. R. Johnson, R. A. King, G. A. Mathia, E. C. Pasour Jr., R. A. Schrimper, J. A. Seagraves, R. L. Simmons, J. G. Sutherland (USDA), C. B. Turner, J. C. Williamson Jr.; *Adjunct Professor:* D. R. Dixon; *Professor Emeriti:* E. W. Swanson, T. W. Wood; *Associate Professors:* D. S. Ball, J. B. Bullock, G. A. Carlson, J. S. Chappell, M. M. El-Kammash, R. M. Fearn, B. L. Gardner, H. C. Gilliam Jr. (USDA), C. W. Harrell Jr., D. N. Hyman, T. Johnson, C. P. Jones, E. W. Jones, F. A. Mangum Jr., R. J. Peeler Jr., R. K.

Perrin, J. C. Poindexter Jr., R. E. Sylla, J. W. Wilson; *Assistant Professors:* L. E. Danielson, L. M. Ennis Jr., A. R. Gallant, T. J. Grennes, J. S. Lapp, R. B. McBurney Jr., M. B. McElroy, L. B. Perkinson (USDA), W. P. Pinna; *Assistant Professor Emeriti:* J. C. Matthews Jr., O. G. Thompson; *Instructors:* A.M. Beals Jr., W. W. Brooks, S. K. Happel, M. R. Hilliard, M. T. Holcomb, D. M. Holmes, J. M. Jeffreys, S. K. Palmer; *Special Lecturer:* W. P. Windham; *Associate Members of the Faculty:* W. D. Cooper (Textile Technology), D. L. Holley (Forestry)

EXTENSION

Professor F. D. Sobering, *In Charge Extension Economics*

Professors: R. C. Brooks, G. L. Capel, D. G. Harwood, T. E. Nichols Jr., E. A. Proctor, C. R. Pugh, W. L. Turner, C. R. Weathers, R. C. Wells; *Associate Professors:* J. G. Allgood, R. S. Boal, R. D. Dahle, L. H. Hammond, H. A. Homme, J. E. Ikerd, H. L. Liner, D. F. Neuman, P. S. Stone; *Assistant Professor:* J. E. Easley Jr.; *Assistant Professor Emeriti:* E. M. Stallings, R. P. Uzzle; *Instructor:* D. C. Pardue

The economics and business program develops in the student critical and analytical skills which underlie the ability to understand contemporary problems and institutions, both in their historical setting and under conditions of change. The curriculum furnishes the academic background necessary for positions in industry, government service and graduate work (see pages 12-14 and consult the Graduate Catalog) in economics, business and the social sciences.

The Department of Economics and Business offers degrees in several undergraduate fields of study. These include the Bachelor of Arts degrees in accounting, business management, economics and the Bachelor of Science degree in economics. In addition, the department offers the social studies teacher education option to prepare the student for "A" certification in North Carolina secondary schools.

The department is administered jointly by the Schools of Agriculture and Life Sciences and Liberal Arts. For information on agricultural economics, see pages 65-68.

The department also provides service courses for the various technical schools and the Division of Continuing Education. An increasing number of curricula now offer a minor program in economics or business.

The department maintains a library including technical reference books, major professional journals and government publications. Research publications from other institutions throughout the United States are on file. Computational facilities are available for students whose research problems involve extensive analysis of data, as well as for those students who want to learn to use computer facilities. The department has a specially-trained clerical and programming staff and has access to an IBM System/370 Model 165 operated by the Triangle University Computational Center. Access is also available to other medium speed terminals and an IBM System/360 Model 40 located on the University campus.

BACHELOR OF ARTS IN ECONOMICS

The Bachelor of Arts degree in economics consists of 27 hours in prescribed and elected courses. Of these, 12 hours are required in the core. The remaining 15 hours are economics electives which are primarily society oriented.

		Credits
EC 301	Production and Prices	3
EC 302	Aggregate Economic Analysis: Theory and Policy	3
EC 317	Introduction to Methods of Economic Analysis*	3
EC 490	Senior Seminar in Economics	3
	Restricted Electives in Economics	15
		27

* ST 311, 361, or 371 may be substituted for EC 317.

BACHELOR OF ARTS IN ACCOUNTING

The Bachelor of Arts degree in accounting consists of 39 hours in prescribed and elected courses. Of these, 12 hours are required in the core. The remaining 27 hours are divided among six hours of electives in economics and 21 hours in accounting courses.

		Credits
EC 301	Production and Prices	3
EC 302	Aggregate Economic Analysis: Theory and Policy	3
EC 317	Introduction to Methods of Economic Analysis*	3
ACC 468	Professional Accountancy Resumé	3
	Restricted Electives in Economics	6
	Accounting Concentration	21
		39

* ST 311, 361, or 371 may be substituted for EC 317.

BACHELOR OF ART IN BUSINESS MANAGEMENT

The Bachelor of Arts degree in business management consists of 33 hours in prescribed and elected courses. Of these, 18 hours are required as the core. The remaining 15 hours are divided among six hours of electives in economics and nine hours from three of the five areas of business concentration.

		Credits
ACC 260	Accounting I—Concepts of Financial Reporting	3
EC 301	Production and Prices	3
EC 302	Aggregate Economic Analysis: Theory and Policy	3
EC 317	Introduction to Methods of Economic Analysis*	3
EC 307	Business Law I	3
EC 490	Senior Seminar in Economics	3
	Restricted Electives in Economics	6
	Electives from Areas of Business Concentration	9
		33

* ST 311, 361, or 371 may be substituted for EC 317.

SOCIAL STUDIES TEACHER EDUCATION OPTION

The Bachelor of Arts degree with a major in economics, social studies teacher education option, consists of a modified economics major plus 24 hours of complementary courses in history, sociology, anthropology and politics. Additional courses in psychology and education (including student teaching) in the 129 hour program complete the requirements for "A" certification. The social studies teacher education program is open to majors in economics, history, politics, and sociology and anthropology. Admission to the program, however, is limited to approximately 15 students per semester. Applicants are selected on the basis of academic competition and dedication to teaching.

		Credits
EC 301	Production and Prices	3
EC 302	Aggregate Economic Analysis: Theory and Policy	3
EC 317	Introduction to Methods of Economic Analysis*	3
	Restricted Electives in Economics	15
	Total Economics Courses	24
	Complementary Courses in History and Social Sciences	24

* ST 311, 361, or 371 may be substituted for EC 317.

BACHELOR OF SCIENCE DEGREE

The Bachelor of Science degree with a major in economics consists of 27 hours in prescribed and elected courses. Of these, 15 or 18 hours are required as the core. Nine of the remaining hours must consist of economics electives.

		Credits
EC 201	Economics I	3
EC 202	Economics II*	3
EC 301	Production and Prices	3
EC 302	Aggregate Economic Analysis: Theory and Policy	3
EC 317	Introduction to Methods of Economic Analysis**	3
EC 490	Senior Seminar in Economics	3
Restricted Electives in Economics		9
		27

* EC 202 may be waived subject to the approval of the student's faculty adviser.
** ST 311, 361, or 371 may be substituted for EC 317.

ELECTIVE COURSES

Students must complete at least two courses selected from the specified list of economics electives, the two intermediate theory courses (EC 301 and EC 302) and one of the basic statistics courses before enrolling in Senior Seminar (EC 490 or EC 468).

These electives, primarily society oriented are: EC 304, EC 370 (HI 370), EC 371 (HI 371), 410, 413, 422, 430, 431, 435, 436, 442, 448, 451, 475, 491, 501, 502, 515, 521, 533, 540, 550, 551, 555, 561 (ST 561), 570, and 574 (SOC 574).

Additional firm-oriented economics electives are available. These courses are often considered business courses and are intended to provide skills for dealing with problems at firm level. The areas of business concentration are:

Finance: EC 304, 415, 420
Business Management: EC 310, 525, 535
Marketing: EC 311, 313, 430, 521
Personnel: EC 326, 332, 431
Production: EC 303, 325, 523, 551

Courses from other departments may be used to fulfill business concentration requirements upon approval of the Department of Economics and Business.

English

Winston Hall

Professor L. S. Champion, *Head of the Department*

Professor R. B. White, *Assistant Head of the Department*

Professors: M. Halperen, A. S. Knowles Jr., B. G. Koonce Jr., F. H. Moore Jr., G. Owen Jr., W. B. Toole III, P. Williams Jr.; *Professors Emeriti:* L. C. Hartley, H. G. Kincheloe, R. G. Walser; *Associate Professors:* L. J. Betts Jr., P. E. Blank Jr., E. P. Dandridge Jr., J. D. Durant, J. B. Easley, H. A. Hargrave, L. F. Jeffers, W. E. Meyers, M. S. Reynolds, N. G. Smith, J. J. Smoot, H. C. West, M. C. Williams; *Assistant Professors:* B. H. Baines, M. M. Brandt, J. W. Clark Jr., V. C. Downs, A. H. Harrison, W. E. Haskin, M. T. Hester, J. A. Kilby Jr., R. A. Lasseter III, V. B. Lentz, D. M. Lucas, C. E. Moore N. B. Rich, J. M. Robertson, D. D. Short, J. N. Wall Jr., S. S. Ward, R. V. Young Jr.; *Instructors:* C. M. Blackman, J. H. Bolch, L. T. Holley, H. J. Joseph, R. A. Kemp, L. H. Mackethan, S. R. Ricks, K. S. Spears

The Department of English offers basic and advanced courses in composition, language, and literature. The freshman courses, common to all curricula and prerequisite to all advanced courses in English, are designed to give intensive training and practice in written communication, in addition to an introduction to literary types. Courses in communication of technical information and in creative and advanced expository writing are offered to meet requirements in special curricula and to provide elective credits. Advanced courses are available for a major in literature (Bachelor of Arts program), a major in English—writing and editing option (Bachelor of Arts program), and a concentration in literature (Bachelor of Science program), as well as for general electives.

For graduate degrees, see pages 12-14.

B. A. PROGRAM, MAJORS IN ENGLISH

Bachelor of Arts Degree Program—The student must schedule 36 semester hours beyond the usual six hours in freshman composition. Basic requirements include the sophomore survey of English literature, a course in Shakespeare, and at least one course in American writers. Beyond these courses, the student may pursue special interests within the limits of two recommended categories. In the final semester, a special seminar (ENG 496) will serve as a capstone to one's study.

Bachelor of Arts in English—Writing and Editing Option—The student must schedule 30 semester hours beyond the usual six hours in freshman composition. Courses are included in journalism, technical writing, public speaking, radio, television, and literature. In the final semester, a special seminar (ENG 496) will serve as a capstone to one's study. Additionally the student must schedule 15-18 semester hours in a track or discipline in which one wishes to apply communication skills.

B. A. PROGRAM, TEACHER EDUCATION OPTION IN ENGLISH

English majors may enroll in the teacher education option offered by the School of Liberal Arts in cooperation with the School of Education. Students who complete this program are eligible to apply for certification to teach English in secondary schools in North Carolina. The requirements of the program include 19 semester hours in professional courses and 36 semester hours in English beyond the usual six hours in freshman composition. Students desiring to enter this program should declare their intention before the spring of the sophomore year and are required to file a formal application for admission which must be approved in order for them to participate.

B. S. PROGRAM, CONCENTRATION IN ENGLISH

Bachelor of Science Program—The student, in consultation with his department adviser, must schedule 27 semester hours beyond the usual six hours in freshman composition, including the senior seminar.

Foreign Languages

Harrelson Hall

Professor A. A. Gonzalez, *Head of the Department*

Professors: G. W. Poland, E. M. Stack; *Associate Professors:* F. J. Allred, J. R. Kelly, M. Paschal, E. W. Rollins Jr., H. Tucker Jr.; *Assistant Professors:* T. P. Feeny, G. Gonzalez, W. M. Holler, D. R. Kloe, V. M. Prichard, C. R. Reynolds, S. E. Simonsen, J. H. Stewart, G. G. Smith; *Instructors:* S. de la Queriere, D. Girardi, K. Hughes, E. M. Jezierski

MAJORS IN FRENCH OR SPANISH

All the general requirements for the Bachelor of Arts degree must be met, including either ENG 261, 262 or ENG 265, 266. Majors may not substitute courses in foreign literatures for these. Degree designations are: B.A. in French Language and Literature, B.A. in Spanish Language and Literature, French Language and Literature Teacher Education option and Spanish Language and Literature Teacher Education option.

Bachelor of Arts degree. Students must complete 30 hours beyond the elementary courses (101-102), including a senior seminar. Majors must take 12 additional hours in related studies. This can be a second foreign language or courses, either in this or other departments, clearly related to the major concentration.

B.A. program with Teacher Education Option. In collaboration with the School of Education, the department offers a program upon completion of which graduates may be certified as secondary school modern language teachers in the North

Carolina public school system. Candidates should advise their academic counsellor as early as possible for the proper planning of their curriculum. They should formally declare their intention by the spring semester of the sophomore year.

No graduate degrees are given in modern languages, but special courses and certification examinations are offered for advanced degree students.

History

Harrelson Hall

Professor B. W. Wishy, *Head of the Department*

Associate Professor J. P. Hobbs, *Assistant Department Head*

Professors: B. F. Beers, M. L. Brown Jr., M. S. Downs, R. W. Greenlaw, D. E. King, S. M. Noblin; *Professor Emeritus:* L. W. Seegers; *Associate Professors:* W. H. Beezley, R. N. Elliott, W. C. Harris, J. M. Riddle, R. H. Sack, S. Suval, M. E. Wheeler; *Associate Professor Emeritus:* L. W. Barnhardt; *Adjunct Associate Professor:* T. W. Mitchell; *Assistant Professors:* J. R. Banker, C. H. Carlton, C. J. Constantin, C. W. Harper Jr., C. F. Kolb, H. D. Metzgar Jr., D. M. Scott, E. D. Sylla; *Instructors:* J. E. Crisp, F. F. Czupryna, J. A. Mulholland, D. T. Nelson

An understanding of the historical background of our times is expected of the educated person. The Department of History makes it possible for students to gain this understanding through a wide range and variety of courses at all levels from introductory through graduate.

A wide range of introductory courses is available to satisfy the history requirement or part of the humanities and social sciences requirement in most University curricula. Students in the School of Liberal Arts are required to take two courses in history—one dealing with a culture significantly different from our own in pre-industrial Western or non-Western societies and the other dealing with our own culture in the United States or post-industrial Western societies.

The Department of History in cooperation with the Division of Continuing Education makes available a variety of introductory courses by correspondence. Some introductory courses and most graduate courses are offered in the evening.

For graduate degrees offered, see pages 12-14.

BACHELOR OF ARTS DEGREE PROGRAM

A history major must take 30 hours of course work in history in addition to the six hours required of all students in the School of Liberal Arts. These 30 hours must include a senior seminar. At least 24 hours of the 30 must be at the 300 level or above.

BACHELOR OF ARTS PROGRAM WITH TEACHER EDUCATION OPTION

History majors may enroll in the teacher education program offered by the School of Liberal Arts in cooperation with the School of Education. Students who complete this program are eligible for certification to teach social studies in secondary schools in North Carolina. In addition to Bachelor of Arts degree requirements, students are required to take professional courses in education and psychology and additional social sciences courses. Students desiring to enter this program should declare their intention during their sophomore year. They are required to file an application for formal admission during their junior year. Admission is competitive and the criteria include an overall grade point average of 2.5 or better.

BACHELOR OF SCIENCE PROGRAM

A concentration in history involves 18 hours of course work beyond the six hours required of all students in the School of Liberal Arts, plus a senior seminar. Of the 18 hours, at least 12 must be at the 300 level or above.

Multi-Disciplinary Studies

Multi-Disciplinary Studies Committee

Professor R. S. Bryan (Philosophy and Religion), *Chairman*

Professor W. B. Toole (English)

Associate Professor W. C. Harris (History)

Associate Professor M. M. Sawhney (Sociology and Anthropology)

Associate Professor J. W. Wilson (Economics and Business)

The multi-disciplinary studies program allows a student to design his or her own academic major. Instead of following the requirements for a major in *one* of the traditional disciplines, the candidate for the Bachelor of Arts degree in multi-disciplinary studies has the responsibility of organizing a concentration or field of specialization from *two or more* disciplines. A concentration in Latin American studies might, for example, combine related courses in language, literature, history, economics, sociology, and politics.

The freshman and sophomore basic requirements for the multi-disciplinary studies program are the same as for the other Bachelor of Arts programs in Liberal Arts. In satisfying basic requirements in language, humanities, social science, mathematics and natural science, the student should, whenever possible, choose those courses that are most appropriate as background for the courses in his major concentration.

ADMISSION TO THE PROGRAM

To become a candidate for a major in multi-disciplinary studies, a student first secures application forms and information from the office of the dean of the School of Liberal Arts (Tompkins Hall, Room 118) or from the office of the chairman of the Multi-Disciplinary Studies Committee (Harrelson Hall, Room 122), then prepares a tentative proposal which includes a list of courses comprising 30 credit hours and an essay of 300-500 words explaining one's reasons for desiring to make this set of courses the field of specialization. The student's proposal is reviewed by a faculty sponsor and submitted to the Multi-Disciplinary Committee for consideration. After a thorough examination to determine whether the set of courses proposed as a multi-disciplinary major is academically sound and coherent, the committee will recommend that the Dean of Liberal Arts accept or reject the proposal; or it will be sent back to the student and his sponsor with suggestions for modification and resubmission.

Philosophy and Religion

Harrelson Hall

Professor R. S. Bryan, *Head of the Department*

Associate Professor W. C. Fitzgerald Jr., *Assistant Head of the Department*

Professor: P. A. Bredenberg; *Associate Professors:* W. L. Highfill, R. S. Metzger, J. L. Middleton, T. H. Regan, A. D. VanDeVeer; *Assistant Professor:* W. R. Carter; *Instructors:* R. P. Forrer, W. G. Gillmor, H. D. Levin, R. I. Nagel, C. L. Stalnaker, C. W. Thompson

The Department of Philosophy and Religion at North Carolina State University: 1) serves the needs of the University at large by providing courses devoted to the discussion of the great philosophic ideas of western civilization and of the religious notions which have had an impact on all of civilization, and 2) provides an opportunity for extensive technical study in philosophy for those students who wish to concentrate in this field either for its own sake or as an ideal intellectual foundation for subsequent graduate or professional study.

Programs lead to two degrees in philosophy, the Bachelor of Arts and the Bachelor of Science. Candidates for the Bachelor of Arts degree in philosophy must complete 30 hours in philosophy not including the introductory course, Problems and Types of Philosophy (PHI 205). These must include either Logic (PHI 201) or Symbolic Logic (PHI 335); courses in the development of western philosophic thought (PHI 300, 317, and 318); and a seminar (PHI 490). Candidates for the Bachelor of Science degree in philosophy must complete 27 hours in philosophy. These must include PHI 300, PHI 317, PHI 318, PHI 335, PHI 490 and PHI 405, Philosophy of Science.

Physical Education

Carmichael Gymnasium

Professor F. R. Drews, *Head of the Department*

Professor Emeritus: P. H. Derr; *Associate Professors:* J. B. Edwards Jr., A. M. Hoch, H. Keating, W. R. Leonhardt, W. H. Sonner; *Assistant Professors:* G. R. Boettner, N. E. Cooper, J. M. Daniels, J. W. Isenhour Jr., W. P. Marley, M. S. Rhodes, W. M. Shea, E. A. Smaltz; *Instructors:* A. L. Berle, J. V. Brothers, W. A. Cheek, R. C. Combs, T. W. Evans, R. G. Gwyn, V. M. Leath, C. E. Patch, J. L. Shannon, G. E. Wall

North Carolina State University requires from two to four semesters in physical education to be taken consecutively during the freshman and sophomore years. The specific number of semesters of required physical education is determined for each student by the Department of Physical Education. Insofar as faculty, facilities and allotment of time permits, each student is guided into courses which will best meet individual needs.

Prescribed Courses—Prescribed courses are designed to meet the specific student needs as determined by tests. Prescribed courses are: Health and Physical Fitness, Beginning Swimming I, Beginning Swimming II, Restricted Activity I and Restricted Activity II. The Health and Physical Fitness course is required of all new freshmen. The Department of Physical Education also requires a demonstrated survival swimming ability or placement in the appropriate beginning swimming course.

Controlled Elective Courses—Elective courses are grouped under one of these areas: aquatics, combatives, developmental activities, individual sports and team sports. Students are encouraged to develop proficiency in at least two vigorous lifetime sports.

The course PE 280, Emergency Medical Care and First Aid, is offered as an elective but does not constitute credit towards meeting physical education requirements.

Politics

Tompkins Hall

Professor W. J. Block, *Head of the Department*

Professors: F. V. Cahill, J. T. Caldwell, A. Holtzman, R. O. Tilman; *Associate Professors:* W. G. Ellis, J. H. Gilbert, H. G. Kebschull, J. M. McClain, K. S. Petersen, J. O. Williams; *Assistant Professors:* B. B. Clary, J. A. Hurwitz, T. E. Marshall, J. P. Mastro, E. R. Rubin, M. S. Soroos; *Instructors:* G. R. Rassel, D. W. Stewart, D. A. Wentworth

The Department of Politics offers basic and advanced courses in all major fields of the discipline: American government and politics (local, state and national), comparative government and politics, international relations and organizations, political theory, public administration and methodology of political science. The department provides an area in which students may concentrate their major efforts, and it affords opportunities for the study of government and administration to students in other curricula and schools.

Graduate courses in politics are available at N. C. State and at Fort Bragg. For graduate degrees see pages 12-14 and consult the Graduate Catalog.

The department conducts a State Legislative Internship Program in alternate years. It also participates in the State Government Internship program, which functions under the sponsorship of the Institute of Government at Chapel Hill.

MAJOR IN POLITICS

Bachelor of Arts Program—A major in politics requires 30 hours of course work in the discipline, including PS 201, The American Governmental System; PS 202, Introduction to Politics; PS 391, Methodology of Political Science; a subsequent seminar in politics; and a course in early or modern political theory. Students include in their programs advanced courses in at least three of the fields in the discipline, although they may concentrate their work in one field.

The department recommends that its majors, whenever practicable, take MA 111 and MA 112 in fulfillment of the School of Liberal Arts mathematics requirement.

CONCENTRATION IN POLITICS

Bachelor of Science Program—A concentration in politics requires 27 hours of course work in the discipline, including PS 202, PS 391 and a subsequent seminar in politics.

Criminal Justice (either B.A. or B.S.)—The Departments of Politics and Sociology and Anthropology offer undergraduate majors a concentration in criminal justice. This concentration includes 24 semester hours of specialized study. The program develops students who may move into middle management and policy making positions in agencies such as police, court, correctional, probation and parole agencies.

Students interested in criminal justice should contact David Wentworth, 221 Tompkins Hall, politics, or Dr. Elizabeth Suval, 230 1911 Building, sociology and anthropology.

Teacher Education Option—A major in Politics may also choose a teacher education option. This is a 130-credit hour degree program which includes the normal 30-hour major plus the required professional education courses. Successful completion of the program leads to certification to teach social studies in the secondary schools.

Sociology and Anthropology

(Also see Agriculture and Life Sciences)

1911 Building

Professor S. C. Mayo, *Head of the Department*

TEACHING AND RESEARCH

Professors: L. W. Drabick, C. P. Marsh, G. C. McCann, H. D. Rawls, J. N. Young; *Professor Emeritus:* C. H. Hamilton; *Associate Professors:* R. C. Brisson, W. B. Clifford II, A. C. Davis, C. V. Mercer, R. L. Moxley, R. D. Mustian, M. M. Sawhney, E. M. Suval, O. Uzzell; *Adjunct Associate Professors:* W. J. Buffaloe, R. L. Rollins Jr.; *Assistant Professors:* C. G. Dawson, G. L. Faulkner, T. M. Hyman, K. D. Kim, G. S. Nickerson, J. G. Peck, L. J. Rhoades, I. E. Russell, D. J. Steffensmeier, P. L. Tobin, M. L. Walek, J. M. Wallace, R. C. Wimberley; *Adjunct Assistant Professor:* J. L. Franklin; *Visiting Assistant Professor:* H. L. Adkins

EXTENSION

Associate Professor: J. N. Collins, *In Charge of Community Development*

Professor: J. D. George; *Professor Emeritus:* J. W. Crawford; *Associate Professors:* T. N. Hobgood Jr., P. P. Thompson, M. E. Voland; *Assistant Professors:* J. A. Christenson, V. E. Hamilton, C. E. Lewis

This department teaches students the principles and techniques for understanding human group behavior. The department seeks: 1) to train students to become leaders in organizing groups and communities and in administering programs; 2) to qualify exceptional students on the undergraduate and graduate levels for sociological research, teaching and extension work; 3) to solve problems in human group relations through scientific research; and 4) to extend research results to the people of the State.

BACHELOR OF ARTS DEGREE

The following departmental requirements must be met by all students majoring in sociology: A minimum of 30 hours in the major field including SOC 202, Principles of Sociology; SOC 301, Human Behavior; SOC 315, Social Thought; SOC 416, Research Methods; a minimum of five electives on the 300 or higher level in sociology; and one semester of SOC 490, Senior Seminar in Sociology. The department also requires ANT 252, Cultural Anthropology, at least one course in psychology and one elective in statistics. The department offers students specific career opportunities in the following:

Social Work—This concentration prepares a student for employment in many social welfare agencies and programs. The social worker seeks to foster productive interaction between man and his world. He seeks to do this through an understanding and use of a knowledge of human behavior and relationships, of social trends and problems affecting human lives and of the structure and dynamics of social organization and society. The Department's social work concentration includes eight social work courses which begin in the sophomore year and includes a special section for social work students in the Senior Seminar.

Criminal Justice—The criminal justice option seeks to develop a professional orientation that will be relevant both to occupational goals and participation as a citizen in community affairs. Courses in both politics and sociology are included in a 28-hour block that provides a general background in crime causation and agencies of criminal justice plus the opportunity to select from more specific courses dealing with deviance, juvenile delinquency, the court system, correctional facilities, and the like, including field placement in an agency of the criminal justice system.

Social Studies Teacher Education Option—This curriculum prepares the student for state certification in social studies in the secondary school system. The inclusion of a professional semester with practice teaching and the need for a broad base in the social sciences makes this a comparatively demanding program with somewhat less opportunity for free electives. Courses in education and psychology are taken beginning in the sophomore year in preparation for the teaching experience. In addition, the student learns the basic concepts of economics, political science, anthropology, and history, as well as sociology.

Speech-Communication

Tompkins Hall

_____, * *Head of the Department*

Professor: C. Parker; *Associate Professor Emeritus:* L. H. Swain; *Associate Professors:* L. R. Camp, W. G. Franklin; *Assistant Professors:* J. Malcolm, H. Munn; *Instructors:* T. L. Attaway, R. Francesconi. N. Snow, C. White

The Department of Speech Communications offers courses in the arts and sciences of human communication. In addition to formal coursework, co-curricular activities are available to the student in forensics, drama and the electronic media.

MAJOR IN SPEECH-COMMUNICATION

Bachelor of Arts Degree Program—The major in speech-communication includes 30 semester hours. The curriculum in speech-communication requires four prescribed courses in speech and the usual senior seminar designed to culminate study. The student may elect courses within the field from among offerings in interactive communication, public address, oral interpretation, drama, and radio-television to complete the 30-hour requirement.

TEACHER EDUCATION OPTION IN SPEECH-COMMUNICATION

Bachelor of Arts Program—Speech majors may enroll in the teacher education program offered by the School of Liberal Arts in cooperation with the School of Education. Students who complete this program are eligible to apply for certification to teach speech in secondary schools in North Carolina. The requirements of the program include 25 semester hours in professional courses and 30 semester hours in speech. Students desiring to enter this program should declare their intention before the spring of the sophomore year and are required to file a formal application for admission which must be approved in order for them to participate.

CONCENTRATION IN SPEECH-COMMUNICATION

Bachelor of Science Program—The student, in consultation with his departmental adviser, must schedule 27 semester hours in speech, including the senior seminar.

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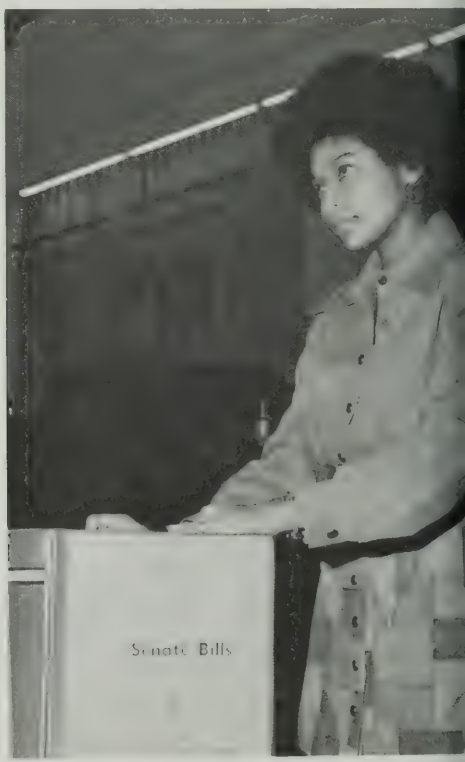
* Head to be named. Department of Speech-Communication established July 1, 1975.

Biological sciences classes combine audio visual and lecture materials with examples, such as in this plant diversity unit.



NCSU politics students utilize the resources unique to a state capitol, and some students are legislative interns.

PHYSICAL AND MATHEMATICAL SCIENCES

Cox Hall

A. C. Menius Jr., *Dean*

J. D. Memory, *Associate Dean*

The School of Physical and Mathematical Sciences trains potential scientists and mathematicians; gives technical support to curricula in North Carolina State's other seven schools; and does research in physical sciences and mathematics. These activities are carried out by seven academic departments: biochemistry,chemistry, computer science, statistics, geosciences, mathematics and physics. The Institute of Statistics (Raleigh section) and the Department of Physical Sciences Research are also associated with the School of Physical and Mathematical Sciences.

Graduates of the school are recruited for technical and administrative positions in industrial research and development laboratories, universities and colleges, nonprofit research organizations and government agencies. A large percentage of the graduates undertake advanced study leading to the Master of Science and Doctor of Philosophy degrees.

The high school student with an above-average performance in mathematics, chemistry or physics, and a basic interest in natural phenomena and their mathematical descriptions, should consider a career in physical sciences or mathematics. The school consistently attracts outstanding students; approximately one-third of its students graduate with honors or high honors.

FACILITIES

Classrooms and School offices in the campus' center are listed under each department. In addition, physics research laboratories are located in Daniels Hall and the Nuclear Science Building and at the Triangle Universities Nuclear Laboratory in Durham. Biochemistry research is underway in Polk and Withers Halls.

Special equipment and laboratories include a plasma physics laboratory supported by a research tube-making facility; a radio-chemistry laboratory; a one-million volt Van de Graaff accelerator; analog and ambilog computers; an IBM 1130 digital; a laser research laboratory; a Varian Associates HA-100 high resolution nuclear magnetic resonance spectrometer; an upper atmosphere laboratory; a biomathematics and biophysics laboratory; undergraduate and graduate desk computing laboratories; biochemical research and teaching laboratories; and an ultraviolet-infrared-visible spectroscopic laboratory. Other campus facilities for teaching and research are electron microscopes, a heterogeneous nuclear reactor designed for operation at 100 kilowatts, complete x-ray laboratories with diffraction and radiographic equipment, a Beckman Model E analytical ultracentrifuge, precision instrument shops, and an IBM 360 Model 40 digital computer connected by telecommunication lines to the Model 75 at the Triangle Universities Computation Center. N. C. State also participates in the Triangle Universities Nuclear Laboratory which has a 0-35 Mev. cyclo-graaff accelerator.

CURRICULA

The school offers undergraduate programs of study leading to the Bachelor of Science degree with a major in chemistry, computer science, geology, mathematics, meteorology, physics or statistics. These curricula have similar freshman years, enabling a freshman to change, without loss of time, from one department to another in the school.

SHORT COURSES AND INSTITUTES

Several short courses and specialized institutes are offered throughout the academic year and during the summer months in chemistry, computer science, geology, mathematics, physics, and statistics for high school teachers and college professors. For information, write the School dean.

In addition, certain regular courses may be taken for credit through correspondence or evening classes through the Division of Continuing Education in Raleigh, Charlotte or in the Greensboro-Burlington-Winston-Salem area. For information write North Carolina State University Division of Continuing Education, Raleigh.

SUPERIOR STUDENT AND HONOR PROGRAMS

Exceptional students may be selected to participate in the Superior Student Program during their freshman and sophomore years. Enriched courses in chemistry, English, mathematics, and physics have been developed specifically for program participants. At the beginning of the junior year, promising students may select special courses, participate in undergraduate research, and receive some graduate credit toward the Master of Science degree during the senior year.

Well-prepared students entering the school may seek advanced placement in chemistry, history, mathematics, or physics by passing qualifying examinations.

STUDENT ACTIVITIES

In addition to University-wide extracurricular activities and honor organizations, the School of Physical and Mathematical Sciences has student chapters of the following professional and honor organizations: Society of Physics Students, Pi Mu Epsilon, the American Chemical Society, and the Association for Computing Machinery.

The Science Council, composed of elected students from the school, sponsors and participates in a wide variety of technical and social activities.

GRADUATE STUDY

The Master of Science degree is available with a major in biochemistry, biomathematics, chemistry, geology, marine sciences, statistics, mathematics, applied mathematics and physics. The Master of Biomathematics is offered. The Doctor of Philosophy degree is available in biochemistry, biomathematics, chemistry, marine sciences, statistics, mathematics, applied mathematics and physics.

Chemistry

Dabney Hall and Withers Hall

Professor C. L. Bumgardner, *Head of the Department*

Professor R. H. Loeppert, *Assistant Professor* W. P. Ingram Jr., *Assistant Heads of the Department*

Professor F. C. Hentz Jr., *Assistant Head for Undergraduate Instruction*

Professors: H. A. Bent, L. H. Bowen, L. D. Freedman, F. W. Getzen, Z Z. Hugus Jr., S. G. Levine, G. G. Long, C. G. Moreland, P. P. Sutton, W. P. Tucker, R. C. White; *Adjunct Professor:* M. E. Wall; *Professors Emeriti:* G. O. Doak, W. J. Peterson, W. A. Reid, C. C. Robinson; *Associate Professors:* J. Bordner, H. H. Carmichael, T. C. Caves, A. F. Coots, M. K. DeArmond, C. E. Gleit, K. W. Hanck, L. A. Jones, M. L. Miles, A. F. Schreiner, G. H. Wahl Jr., D. W. Wertz; *Associate Professor Emeritus:* W. E. Jordan; *Assistant Professors:* W. R. Johnston, W. L. Switzer, T. M. Ward; *Assistant Professor Emeritus:* T. J. Blalock; *Instructors:* E. H. Manning, G. J. Shaw; *Instructors Emeriti:* J. W. Morgan, G. M. Oliver; *Teaching and Research Technician:* M. C. Bundy

Chemistry is the science dealing with the composition of all substances and changes in their composition. Chemists have contributed to the synthetic fiber industry, petroleum products and fuels, plastics, the food processing industry, nuclear energy, modern drugs and medicine. Today's chemists are concerned with the fundamental building blocks of all materials—atoms and molecules—leading to improvement of old materials, development of new ones and control of our environment.

OPPORTUNITIES

The chemical industry is the nation's largest manufacturing industry. Chemists comprise the largest proportion of scientists in the United States, and future demand for chemists should continue to grow. A variety of jobs is open to the chemist: biochemistry, metallurgy, space science, oceanography, sales or management, pure research. Chemists are employed in almost every field based on modern technology and opportunities in the field of education are many and varied. The Bachelor of Science program in chemistry provides an excellent premedical curriculum.

UNDERGRADUATE CURRICULA

BACHELOR OF SCIENCE IN CHEMISTRY

The Bachelor of Science curriculum (shown below), accredited by the American Chemical Society, includes a strong, broad background in mathematics, physics and the liberal arts. The basic areas of organic, physical, inorganic and analytical chemistry are stressed. Laboratory and classroom work develop the skills, knowledge and inquiring spirit necessary for a successful career in chemistry. The minor field and elective credits allow individual diversity at the junior and senior levels. Many undergraduates participate in current departmental research through part-time employment or a senior research project. The curriculum prepares the student for jobs open to the Bachelor of Science chemist or for advanced graduate work. For graduate degrees, see pages 12-14 and consult the Graduate Catalog.

BACHELOR OF SCIENCE, CHEMICAL SCIENCES OPTION

The chemical sciences option is a more flexible program for students who do not wish to become professional chemists but who wish to pursue interdisciplinary studies with an emphasis on chemistry. This program has less stringent requirements in mathematics, physics and chemistry than does the accredited Bachelor of Science program, thus permitting greater latitude in selection of courses from other disciplines. A student desiring this option should enroll initially in the standard Bachelor of Science curriculum. Near the end of the first year, one may transfer to the option after receiving departmental advisory committee approval for one's goals and program.

B. S. CHEMISTRY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
CH 106 Laboratory Techniques I	1	CH 108 Laboratory Techniques II	1
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 102 Analytic Geometry and Calculus I	4	MA 201 Analytic Geometry and Calculus II	4
Social Science	3	PY 201 General Physics*	4
Physical Education	1	Physical Education	1
PMS 100 Orientation	0		
	16		17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
English Elective	3	English Elective	3
MA 202 Analytic Geometry and Calculus III	4	MA 301 Applied Differential Equations I	3
PY 202 General Physics*	4	PY 203 General Physics*	4
Physical Education	1	Free Electives	3
	16	Physical Education	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 428 Qualitative Organic Analysis	3	CH 401 Systematic Inorganic Chemistry	3
CH 431 Physical Chemistry I	3	CH 433 Physical Chemistry II	3
Humanities—Social Sciences	3	CH 434 Physical Chemistry II Laboratory	2
MLG 101 Elementary German I	3	Humanities—Social Sciences	3
Minor**	3	MLG 102 Elementary German II	3
	15	Minor	3
			17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 411 Analytical Chemistry I	4	CH 413 Analytical Chemistry II	4
Chemistry Elective	2	Humanities—Social Sciences	3
Humanities—Social Sciences	3	Minor	3
Minor	3	Free Electives	6
Free Electives	4		16
	16	Total Hours for Graduation	131

* The sequence PY 205, 208, 407 may be substituted for PY 201, 202, 203, with approval of the adviser.

** The minor may be in any field closely related to chemistry, such as mathematics, physics, computer science, geoscience, statistics, biological sciences, engineering or science education. A total of four courses in two such areas may constitute a "split" minor. The minor field should be chosen in consultation with the faculty adviser prior to or during the junior year.

Computer Science

Dabney Hall

Professor D. C. Martin, *Head of the Department*

Assistant Professor T. L. Honeycutt, *Coordinator of Advising*

Professors: P. E. Lewis, D. A. Link, L. B. Martin; *Associate Professors:* D. R. Deuel, Y. N. Patt; *Adjunct Associate Professor:* L. H. Williams; *Assistant Professors:* S. D. Danielopoulos, R. J. Fornaro, J. W. Hanson, D. F. McAllister, J. D. Powell, W. E. Robbins, W. A. Sillars, A. L. Tharp, N. F. Williamson Jr.; *Instructors;* H. J. Beaujon, A. B. Finger, D. W. Reid

The discipline of computer science has developed during the past 25 years as a direct consequence of rapid growth of the electronic computer. This technological development has great impact on man and the way he lives. Almost all areas of industry, the military establishment, government agencies, education and business use computers and new applications continue to arise. Computers are used to help make and operate our automobiles, airplanes and space ships; to help design our highways, bridges and buildings; to handle banking transactions and to assist in management decisions; to analyze farm production; as a research tool for the scientist; to monitor manufacturing processes, utilities and communication; and to provide a multitude of other services.

OPPORTUNITIES

A wide range of jobs exist for computer scientists since computers have diverse applications. Salaries are good for both men and women. There is a need for basic research into the principles of computer system design and the analysis of computational algorithms and students may choose to continue their training with graduate study.

CURRICULUM

This undergraduate curriculum leads to a degree of Bachelor of Science in computer science. Core courses provide foundations in programming and computer languages, the structure of data, computer architecture, solution methods including numerical analysis and simulation, and the theory of computation. The restricted electives chosen in consultation with one's adviser during the junior year allow exploration of specific computer science areas or fields such as information science, operating systems, computer architecture, and analysis of algorithms. One may study fields in which there are significant computer applications like management, physical, biological, and social sciences, numerical analysis and statistics.

Students in other departments may select courses in computer science as electives to broaden their programs of study and to learn how to use the computer for solving problems.

COMPUTER SCIENCE CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 101 Introduction to Programming	3	CSC 102 Programming Concepts	3
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
Basic Science	3	MA 201 Analytic Geometry and Calculus II	4
MA 102 Analytic Geometry and Calculus I	4	Basic Science	3
Physical Education	1	Physical Education	1
PMS 100 Orientation	0		
	14		14

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 112 Basic Computer Organization and Assembly Language	3	CSC 302 Introduction to Numerical Methods	3
MA 231 Introduction to Linear Algebra	4	MA 312 Introduction to Differential Equations	3
PY 205 General Physics	4	English Literature	3
Humanities—Social Sciences	3	Humanities—Social Sciences	3
Free Elective	3	PY 208 General Physics	4
Physical Education	1	Physical Education	1
	18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 311 Data Structures	3	CSC 312 Computer Organization and Logic	3
CSC 322 Applied Algebraic Structures	3	Restricted Electives	5
ST 371 Introduction to Probability and Statistics	4	Humanities—Social Sciences	3
Restricted Elective	3	Free Electives	6
Humanities—Social Sciences	3		
	16		17

SENIOR YEAR

Fall Semester	*Credits*
CSC 411 Introduction to Simulation	3
Restricted Electives	9
Humanities—Social Sciences	3
	15

Spring Semester	*Credits*
CSC 412 Introduction to Computability Language and Automata	3
Restricted Electives	6
Humanities—Social Sciences	3
Free Elective	3
	15

Total Hours for Graduation 126

Geosciences

Withers Hall

Professor C. J. Leith, *Head of the Department*

Professors: H. S. Brown, E. G. Droessler, W. J. Saucier; *Professors Emeriti:* J. M. Parker III, J. L. Stuckey; *Associate Professors:* R. J. Carson III, V. V. Cavaroc Jr., N. E. Huang, C. E. Knowles, W. H. Spence, A. H. Weber, C. W. Welby; *Adjunct Associate Professor:* J. R. Smith; *Associate Professor Emeritus:* E. L. Miller Jr.; *Assistant Professors:* M. J. Bartholomew, L. J. Pietrafesa, G. F. Watson Jr.; *Adjunct Assistant Professors:* W. D. Bach Jr., J. T. Peterson; *Instructor:* T. L. Tsui

The geosciences include the overlapping divisions of the physical, chemical and biological earth sciences, such as geology, geophysics, geochemistry, hydrology, meteorology, oceanography and paleontology. The Department of Geosciences offers courses in these disciplines and awards the B.A. and B.S. degrees in geology and the B.S. degree in meteorology. Degree programs in oceanography are at the graduate level only. (For graduate degrees offered see pages 12-14 and consult the Graduate Catalog.)

Geology is the professional field in which geological knowledge and techniques are focused on the solution of problems concerned with the environment, with the occurrence, origin, distribution and behavior of rocks, with mineral deposits, with raw material supplies and with a variety of engineering projects. Many engineering undertakings—siting and construction of dams and reservoirs, tunnels, buildings and highways—depend on geological setting knowledge. Discovery, evaluation, development and conservation of mineral resources (including fossil fuels and ground water) and the disposal of liquid and solid wastes require quantitative and analytical application of geologic principles.

Meteorology is the science of the atmosphere, including the processes and the phenomena within the atmosphere, the interactions with earth's land and sea surface below and with the solar atmosphere above. Its objectives are to apply understanding of the atmosphere and the processes within to benefit mankind in his welfare and endeavors. The meteorology curriculum provides basic training for roles in both theory and application. The student is prepared for research or professional applications.

No activity on earth is unaffected by the natural conditions and processes of our atmospheric environment. A familiar purpose of meteorology is to provide weather forecasts, so man may protect himself intelligently from damages by weather and to plan beneficially his individual activities for the immediate future. In addition to weather information reports to the public, meteorology reaches into broader aspects of environmental technology. Increasing concern about "environmental quality," in relation to operations and welfare, and to the impacts on air quality by commerce and industry have led to expanded concepts of atmospheric monitoring and the need for research and services applied to industrial operations, environmental planning, and government regulation. Among meteorology fields are atmospheric pollution, weather modification and control, and interrelations with agriculture, industry, and marine science.

The oceans are the subject of major research programs worldwide. The Department of Geosciences offers undergraduate and graduate courses in geological, meteorological and physical oceanography.

Remote sensing imagery provides a new dimension to geosciences. These data are utilized for teaching and research.

OPPORTUNITIES

Geologists are employed by oil companies, quarrying concerns, exploration companies, construction firms, railroads, public utilities, banks and insurance companies; iron, steel and other metal producers, manufacturers using nonmetallic raw materials such as ceramics, cement and abrasives; municipal, state, and federal government agencies, schools, colleges, museums and research institutes. There is a growing need for the application of geological science to engineering construction in connection with highways, foundations, excavations, beach erosion control and water supply problems. The mineral industry of the Southeast has expanded substantially in the last decade.

Basic meteorological services are provided by federal government agencies, primarily the National Oceanic and Atmospheric Administration and components of the Department of Defense; these agencies are the principal employers of meteorologists. This work may involve atmospheric sensing and measurement, including the use of meteorological satellites and space probes; data analysis and computation; weather forecasting, and guidance services to aeronautics, agriculture, forestry, hydrology, and recreation and public health. Meteorologists are used in environmental planning and regulation at the state and local levels. Power generating and fuel transmission industries, engineering firms, weather consulting firms, insurance companies, major retailing businesses, and schools and colleges and research institutions are employing meteorologists because of recognition of the involvement of the atmosphere on their activities.

GEOSCIENCES CURRICULUM

LEADING TO B.S. DEGREE IN GEOLOGY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II or	
ENG 111 Composition and Rhetoric	3	CH 107 Principles of Chemistry	4
MA 102 Analytic Geometry & Calculus I	4	ENG 112 Composition and Reading	3
GY 120 Physical Geology	2	MA 201 Analytic Geometry & Calculus II	4
GY 110 Physical Geology Laboratory	1	GY 222 Historical Geology	3
Physical Education	1	Physical Education	1
PMS 100 Orientation	0		
	15		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 202 Analytic Geometry & Calculus III	4	MA 301 Applied Differential Equations I	3
PY 205 General Physics	4	PY 208 General Physics	4
GY 330 Crystallography & Mineralogy	3	GY 331 Optical Mineralogy & X-ray Diffraction	4
SP 231 Expository Speaking	3	Electives	3
Physical Education	1	Physical Education	1
	15		15

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
GY 351 Tectonic Structures	3	GY 452 Sedimentary Petrology	4
Social Sciences-Humanities*	3	GY 462 Geological Field Surveying	3
CH 331 Introductory Physical Chemistry**	4	Social Science-Humanities*	3
GY 440 Igneous & Metamorphic Petrology	4	Minor***	3
ST 361 Introduction to Statistics for Engineers	3	CSC 101 Introduction to Programming	3
	17		16

SUMMER SESSION

	Credits
GY 465 Geological Field Procedures (or equivalent field camp)	6

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Geology Elective****	3	Geology Elective****	3
Social Sciences-Humanities*	6	Social Sciences-Humanities*	3
Minor***	3	Minor***	3
ENG 321 The Communication of Technical Information	3	Electives	6
	15		15
		Total Hours for Graduation	129

* Social Science-Humanities: allows students to take any social science-humanities courses, including languages.

** Students electing a minor in physical sciences (chemistry) will substitute CH 431 for CH 331 and will graduate with a minimum of 128 hours. Students who take CH 431 should also take CH 433 as part of the requirements for the minor.

*** Minor—The minor shall be at least three courses in a related professional field to geology such as: civil engineering, engineering science and mechanics, materials engineering, environmental sciences, computer science, statistics, mathematics, chemistry, physics, meteorology, soil science, or biological science.

**** Geology electives must include one of the following: paleontology or mineral exploration and evaluation.

GEOSCIENCE CURRICULUM

LEADING TO B.A. DEGREE IN GEOLOGY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 112 Analytic Geometry and Calculus A	4	MA 212 Analytic Geometry and Calculus B	3
Social Science-Humanities*	3	GY 222 Historical Geology	3
GY 120 Physical Geology	2	Social Sciences-Humanities*	3
GY 110 Physical Geology Laboratory	1	Physical Education	1
Physical Education	1		13
PMS 100 Orientation	0		
	14		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II	4
Social Science-Humanities*	3	Social Science-Humanities*	3
GY 330 Crystallography & Mineralogy	3	GY 331 Optical Mineralogy & X-ray Diffraction	4
Elective	3	Physical Education	1
Physical Education	1	Elective	3
SP 231 Expository Speaking	3		15
	17		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
GY 351 Tectonic Structures	3	Social Science-Humanities*	3
PY 211 General Physics	4	GY 452 Sedimentary Petrology	4
Social Sciences-Humanities*	3	PY 212 General Physics	4
GY 440 Igneous and Metamorphic Petrology	4	CSC 101 Introduction to Programming	3
ST 311 Introduction to Statistics	3	Elective	3
	17		17

SUMMER SESSION

	Credits
GY 465 Geological Field Procedures (OPTIONAL)	6

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
UNI 303 Man and His Environment	3	Geology Elective**	3
Social Science-Humanities*	3	Electives	6
Electives	3	Social Science-Humanities*	6
Geology Elective**	3		15
ENG 321 The Communication of Technical Information	3	Total Hours for Graduation	123
	15		

* Social Science-Humanities requirements shall contain courses in at least three humanities (fine arts, history, literature, language, philosophy, religion) and three social sciences (anthropology, economics, political science, psychology, sociology).

** Geology electives must include one of the following: paleontology, mineral exploration and evaluation, geological surveying.

GEOSCIENCES CURRICULUM

LEADING TO B.S. DEGREE IN METEOROLOGY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 105† Chemistry—Principles & Applications	3
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 102 Analytic Geometry and Calculus I	4	MA 201 Analytic Geometry and Calculus II	4
PMS 100 Orientation	0	PY 205 General Physics	4
Humanities-Social Sciences	3	Physical Education	1
Physical Education	1		
	15		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 202 Analytic Geometry and Calculus III	4	MA 301 Applied Differential Equations I	3
PY 208 General Physics	4	Geophysical Sciences Elective**	3
Communicative Arts*	3	Communicative Arts*	3
Humanities-Social Sciences	3	Technical Elective A***	3
Physical Education	1	Humanities-Social Sciences	3
	15	Physical Education	1
			16

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MY 411 Introductory Meteorology	3	MY 422 Atmospheric Kinematics & Dynamics	3
MY 421 Atmospheric Statics & Thermodynamics	3	MY 435 Measurements and Data Systems	3
ST 371 Introduction to Probability and Statistics	4	Technical Elective A***	3
Humanities-Social Sciences	3	Technical Elective B****	3
Free Elective	3	Free Elective	3
	16		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MY 441 Meteorological Analysis I	3	MY 412 Atmospheric Physics	3
MY 443 Meteorological Laboratory I	4	MY 444 Meteorological Laboratory II	4
Technical Elective B****	3	Technical Elective B****	3
Humanities-Social Sciences	3	Technical Elective A***	3
Free Elective	3	Free Elective	3
	16		16

Total Hours for Graduation 124

† Students who intend to take additional chemistry courses, or who plan technical electives which require additional chemistry, should add CH 104 or replace CH 105 with CH 103 or CH 107. Advanced transfer students are permitted to substitute mathematics, science, or engineering credits for CH 105.

* Modern language or speech and technical writing.

** Geophysical science elective is selected from among GY 101, GY 120, MAS 200, PY 223, SSC 200, CE 201 or 370, FOR 272.

*** Technical elective A includes courses in the sciences, agriculture, and engineering, chosen from lists approved by the major department and school, but excluding more than one advanced course in meteorology. It must include at least one course in computer programming.

**** Technical elective B constitutes a minor field of emphasis, consisting of at least eight credits in that subject. Among those available, but not limited to them, are: chemistry, computer science, geology (physical geology, geophysics), mathematics (to include MA 511), physics (senior courses), statistics (to include a 500-level course), chemical engineering (heat transfer, fluid mechanics, air pollution), civil engineering (hydrology, sanitation, geodetics), electrical engineering (field theory, wave propagation, instrumentation), engineering science and mechanics (fluid mechanics), mechanical-aerospace engineering (heat transfer, fluid mechanics), forestry (protection, mensuration, management), health science (significantly involving atmospheric environment), marine science (upper division and graduate), plant science (significantly involving atmospheric environment), soil science (to include SSC 511).

Mathematics

Harrelson Hall

Professor N. J. Rose, *Head of the Department*

Professor H. V. Park, *Associate Head of the Department*

Professor H. M. Nahikian, *Assistant Head of the Department*

Professor L. S. Winton, *Coordinator of Advising*

Professors: J. W. Bishir, E. E. Burniston, R. E. Chandler, J. M. A. Danby, R. O. Fulp, W. J. Harrington, K. Koh, J. Levine, P. E. Lewis, J. Luh, P. A. Nickel, H. Sagan, H. E. Speece, R. A. Struble, H. R. van der Vaart, O. Wesler; *Associate Professors:* H. C. Cooke, W. G. Dotson Jr., R. E. Hartwig, J. E. Huneycutt Jr., J. R. Kolb, C. H. Little Jr., A. Maltbie, J. A. Marlin, R. H. Martin Jr., C. D. Meyer Jr., A. R. Nolstad, L. B. Page, C. V. Pao, D. M. Peterson, H. A. Petrea, E. L. Stitzinger, J. B. Wilson; *Assistant Professors:* C. N. Anderson, S. L. Campbell, H. J. Charlton, J. E. Franke, D. E. Garoutte, R. Gellar, D. J. Hansen, R. B. Honeycutt, T. Lada, C. F. Lewis, S. O. Paur, R. T. Ramsay, J. A. Roulier, R. G. Savage, J. F. Selgrade, R. Silber, J. L. Sox Jr., D. F. Ullrich, W. M. Waters, R. E. White; *Instructors:* G. M. Brady, D. L. Brant, H. L. Crouch Jr., H. L. Davison, T. F. Gordon

The undergraduate major in mathematics provides a core of basic mathematics courses with a program of electives sufficiently flexible to prepare a student for graduate study in pure or applied mathematics (for graduate degrees, see pages 12-14), for careers in industry, business or government, or for teaching. A carefully selected set of required courses and electives in science, humanities and modern language provides a program well adapted to the demands of modern day life.

Students with a special interest may take the applied mathematics option.

REQUIREMENTS FOR BACHELOR OF SCIENCE IN MATHEMATICS

A total of 126 credits distributed as follows:

Required Mathematics Courses (30 - 31 credits)
- MA 102-201 Analytic Geometry and Calculus I, II
- MA 231 Introduction to Linear Algebra
- MA 232 Introduction to Multivariable Calculus
- MA 312 Introduction to Differential Equations
- MA 403 Introduction to Modern Algebra
- One semester of probability (MA 214, MA 421, MA 541, ST 421 or ST 371)
- MA 425 Mathematical Analysis I
- MA 426 Mathematical Analysis II or MA 512 Advanced Calculus II

Science Requirements (17 - 19 credits)
- CSC 111 or CSC 101
- PY 205 and PY 208
- CH 101
- CH 103, 105, or 107 or geoscience or life science

Required Humanities (15 credits)
- ENG 111, 112
- Literature—one semester
- Introductory history—one semester
- Modern Language at 200 level—one semester

Physical Education (4 credits)

Technical Electives (21 credits)
- These must include at least nine credits of mathematics at 400-500 level and at least nine credits in technical offerings other than mathematics.

Humanities and Social Science Electives (18 credits)
- At least six credits must be at junior-senior level.

Free Electives (18 - 21 credits)

APPLIED MATHEMATICS OPTION

The requirements are the same as above except for technical electives. For this option the 21 credits of technical electives must include MA 430, Introduction to Applied Mathematics, at least one mathematics elective at the 400-500 level and at least 12 credits in depth from technical offerings other than mathematics.

SAMPLE PROGRAM IN MATHEMATICS

(Includes the applied mathematics option.)

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 102 Analytic Geometry & Calculus I	4	MA 201 Analytic Geometry & Calculus II	4
CH 101 General Chemistry I	4	CH 105 Chemistry Principles and Applications	3
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
Introductory History	3	Humanities Elective	3
Physical Education	1	CSC 101 Introduction to Programming	3
	15	Physical Education	1
			17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 231 Introduction to Linear Algebra	4	MA 232 Introduction to Multivariable Calculus	3
PY 205 General Physics	4	MA 403 Introduction to Modern Algebra	3
Literature	3	PY 208 General Physics	4
Modern Language	3	Free Electives	6
Humanities Elective	3	Physical Education	1
Physical Education	1		
	18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 425 Mathematical Analysis I	3	MA 426 Mathematical Analysis II	3
MA 312 Introduction to Differential Equations	3	Probability	3
Humanities Elective	3	Humanities Elective	3
Technical Elective	3	Technical Electives*	6
Free Electives	3		
	15		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Technical Electives	9	Technical Electives*	9
Humanities Elective	3	Humanities Elective	3
Free Elective	3	Free Elective	3
	15		15
		Total Hours for Graduation	126

* One of these must be MA 430 for the applied mathematics option.

Physics

Cox Hall

Professor L. W. Seagondollar, *Head of the Department*

Professor J. T. Lynn, *Assistant to the Head of the Department*

Professors: W. R. Davis, W. O. Doggett, G. L. Hall, A. W. Jenkins Jr., E. R. Manring, J. D. Memory, A. C. Menius Jr., G. E. Mitchell, M. K. Moss, R. R. Patty, D. R. Tilley, A. W. Waltner; *Professors Emeriti:* W. H. Bennett, H. C. Kelly, F. W. Lancaster, J. S. Meares; *Associate Professors:* K. T. Chung, G. C. Cobb, G. H. Katzin, F. Lado Jr., D. H. Martin, J. Y. Park; *Assistant Professors:* C. R. Gould, G. W. Parker III, J. F. Schetzina; *Assistant Professor Emeritus:* E. J. Brown; *Instructor:* H. L. Owen; *Instructor Emeritus:* M. W. C. Harris; *Associate Members of the Department:* J. M. A. Danby (Mathematics), R. E. Fornes (Textiles), R. L. Murray (Nuclear Engineering), D. L. Ridgeway (Statistics)

Physics is a fundamental science of observations, measurements and the mathematical description of the particles and processes of nature. In addition to extending our basic knowledge of the universe, physics provides the means for attacking problems of importance in modern technology. The variety of the contributions made by physicists is indicated by activities such as the discovery of new particles of nature, the invention and use of new instruments to probe interplanetary space, the study of processes fundamental to the release of thermonuclear energy, the development of lasers and solid state devices, and research on missiles, satellites and space craft.

PROGRAMS

The Physics Department provides at both the undergraduate and graduate levels programs of study in fundamental physics and specialization areas including relativity theory, nuclear physics, plasma physics, infrared spectroscopy, magnetic resonance, atmospheric physics, solid state physics and lasers. (See pages 12-14 for graduate degrees and consult the Graduate Catalog.)

UNDERGRADUATE STUDY

The undergraduate curriculum in physics provides the basic training for a career in physics or for graduate study. The curriculum leads to a Bachelor of Science in Physics.

PHYSICS CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PMS 100 Orientation	0	PY 201 General Physics	4
CH 101 General Chemistry I	4	MA 201 Analytic Geometry & Calculus II	4
ENG 111 Composition & Rhetoric	3	CH 107 Principles of Chemistry	4
MA 102 Analytic Geometry & Calculus I	4	ENG 112 Composition & Reading	3
Humanities-Social Sciences	3	Physical Education	1
Physical Education	1		16
	15		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PY 202 General Physics	4	PY 203 General Physics	4
MA 202 Analytic Geometry & Calculus III	4	PY 413 Thermal Physics	3
Free Elective	3	MA 301 Applied Differential Equations I	3
Humanities-Social Sciences	3	Free Elective	3
English Elective	3	Humanities-Social Sciences	3
Physical Education	1	Physical Education	1
	18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PY 411 Mechanics I	3	PY 412 Mechanics II	3
PY 414 Electricity & Magnetism I	3	PY 415 Electricity & Magnetism II	3
PY 451 Intermediate Experiments in Physics I	2	PY 452 Intermediate Experiments in Physics II	2
MA 401 Applied Differential Equations II	3	Mathematics Elective	3
Free Elective	3	Humanities-Social Sciences	3
	14	Free Elective	3
			17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PY 401 Modern & Quantum Physics I	3	PY 402 Modern & Quantum Physics II	3
Technical Elective*	3	Technical Electives*	6
Mathematics Elective	3	Humanities-Social Sciences	3
Humanities-Social Sciences	3	Free Elective	3
Free Elective	3		15
	15	Total Hours for Graduation	127

* Technical or Sciences Electives (above 200 level)

Statistics

Cox Hall

Professor D. D. Mason, *Head of the Department*

Professor F. E. McVay, *Coordinator of Advising*

Professors: B. B. Bhattacharyya, C. C. Cockerham, H. J. Gold, A. H. E. Grandage, R. J. Hader, D. W. Hayne, H. L. Lucas Jr., R. J. Monroe, L. A. Nelson, C. H. Proctor, C. P. Quesenberry, J. O. Rawlings, D. L. Ridgeway, J. A. Rigney. R. G. D. Steel, H. R. van der Vaart, O. Wesler; *Adjunct Professor:* J. T. Wakeley; *Professor Emeritus:* G. M. Cox; *Associate Professors:* T. M. Gerig, F. G. Giesbrecht, M. M. Goodman, W. L. Hafley, A. R. Manson, B. F. Swindel (USFS), J. L. Wasik; *Adjunct Associate Professor:* D. L. Bayless; *Assistant Professors:* A. R. Gallant, A. C. Linnerud; *Adjunct Assistant Professor:* H. T. Sch-

reuder; *Instructor:* J. W. Service; *Senior Research Technologist:* F. J. Verlinden; *Research Associate Technologist:* A. J. Barr; *Research Associates:* J. H. Goodnight, J. Graham; *Associate Statisticians:* H. K. Hamann, B. J. Stines; *Assistant Statisticians:* P. H. Geissler, H. J. Kirk, D. W. Turner, F. T. Wang

Statistics is the body of scientific methodology which deals with the logic of experiment and survey design, the efficient collection and presentation of quantitative information, and the formulation of valid and reliable inferences from sample data.

The Department of Statistics is part of the Institute of Statistics, which includes Departments of Biostatistics and Statistics at Chapel Hill. The Department of Statistics provides instruction, consultation and computational services on research projects for other departments of all schools at North Carolina State University including the Agricultural Experiment Station. Department staff are engaged in research in statistical theory and methodology. This range of activities furnishes a professional environment for training students in the use of statistical procedures in such fields as the physical, biological and social sciences, and in industrial research and development.

The undergraduate program leads to a bachelor of science in statistics. For graduate degrees see pages 12-14 and consult the Graduate Catalog.

OPPORTUNITIES

The importance of sound statistical thinking in the design and analysis of quantitative studies is generally recognized. Industry relies on statistical methods to control the quality of goods in the process of manufacture and to determine the acceptability of goods produced. Statistical procedures based on scientific sampling have become basic tools in such diverse fields as weather forecasting, opinion polling, crop and livestock estimation, and business trend prediction. Because one can improve the efficiency of use of increasingly complex and expensive experimental and survey data, the statistician is in demand wherever quantitative studies are conducted.

TYPICAL STATISTICS CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
CH 101 General Chemistry I	4	CH 103 General Chemistry II	4
MA 102 Analytic Geometry and Calculus I	4	MA 201 Analytic Geometry and Calculus II	4
CSC 101 Introduction to Programming	3	BS 100 General Biology	4
Physical Education	1	Physical Education	1
PMS 100 Orientation	0		
	15		16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ST 371 Introduction to Probability and Statistics	4	PSY 200 Introduction to Psychology	3
MA 231 Introduction to Linear Algebra	3	MA 232 Introduction to Multivariable Calculus	3
PY 205 General Physics	4	PY 208 General Physics	4
EC 201 Economics I	3	EC 202 Economics II	3
Physical Education	1	Major Elective	3
	15	Physical Education	1
			17

JUNIOR YEAR

Fall Semester	*Credits*
ST 421 Introduction to Mathematical Statistics	3
Major Elective	3
Modern Language	3
Humanities Elective	3
Biological Science Elective	3
Free Elective	3
	18

Spring Semester	*Credits*
ST 422 Introduction to Mathematical Statistics	3
Major Elective	3
Modern Language	3
Humanities Elective	3
Free Elective	3
	15

SENIOR YEAR

Fall Semester	*Credits*
ST 501 Basic Statistical Analysis	3
Major Elective	3
ENG 321 The Communication of Technical Information	3
Humanities Elective	3
Free Elective	3
	15

Spring Semester	*Credits*
ST 502 Basic Statistical Analysis	3
Major Elective	3
SP 231 Expository Speaking	3
Humanities Elective	3
Free Elective	3
	15

Total Hours for Graduation 126

Design students develop models to fit real situations; here, a renovations model is discussed.

Geology students on a weekend field trip view a landslide site in the Virginia mountains.

TEXTILES

Nelson Textile Building

D. W. Chaney, *Dean*

W. E. Smith, *Assistant to the Dean for Student Services*; M. L. Robinson Jr., *Academic Coordinator*; M. R. Shaw, *Assistant Dean for Research*; D. S. Hamby, *Director, Textiles Extension and Continuing Education*; W. H. Hard, *Assistant to the Director of Textiles Extension and Continuing Education*; H. T. Pratt, *Adjunct Extension Associate Professor*; P. D. Emerson, *Head, Machine Design and Development*; C. M. Asbill Jr., *Professor Emeritus, Machine Design and Development*; J. G. Baker, *Librarian, Burlington Textiles Library*; M. E. Campbell, *Dean Emeritus*

The field of textiles is broad. It covers almost every aspect of our daily lives—with applications in medicine, space, recreation and sports, personal safety, environmental improvement and control, transportation and in household and apparel uses. These versatile materials—textiles—are made to exacting design specifications by a variety of modern high-speed processes, utilizing tools such as lasers, electronics and computers. Textiles begins with the synthesis of fibers by man or by nature; it carries through a myriad selection of processes for fabric formation, including the steps necessary to make fabrics useful, such as the manufacture of dyestuffs and coloring, chemical auxiliaries and finishes, cutting and fashioning into end-use products.

The approximately 5,000 graduates of the School of Textiles hold diverse positions, mostly in North Carolina. In the textile and related industries, occupations range from manufacturing management, sales, corporate management, designing and styling, research development and technical service to quality control and personnel management. These textile graduates are in the creative and management decision-making aspects of the industry. They plan the flow of materials and machines. They create new products and processes. They solve product and process problems. They create styles, designs, patterns, colors, textures, and structures for apparel, home and industrial uses. They engineer the systems and products required of industrial, space, medical, apparel and other uses of textile products. They deal with computers, automation, product quality, plant performance and environmental problems. They manage large and small companies, personnel, and systems.

The School of Textiles prepares young people for careers in the above occupations. A broad background is stressed; two-thirds of the educational program can come from the resources of the University outside the School. Opportunities remain excellent, with the School maintaining one of the University's best placement records. Demand for textile graduates from North Carolina State University is particularly strong, due in part to the strength of the academic programs. These programs are organized in two departments: textile technology and textile chemistry.

CURRICULA

The School of Textiles offers a broad curricula choice depending upon individual interests. Terminal Bachelor of Science programs in textile technology or in textile chemistry permit a broad choice of courses in addition to required core courses. For example, a student may specialize in yarn or fabric structures, in textile economics and marketing or in fabric styling and design. The student's curriculum includes humanities, social sciences and basic sciences and, may result in a concentration in economics, industrial engineering, languages, mathematics, physics, chemistry, political science, statistics or textile chemistry (or technology). The structure of the course sequence may allow graduate study in either the field of concentration or in textile chemistry or technology. It is possible, with one summer of extra work, to obtain a double degree, for example in textile technology and chemistry.

Curricula leading to graduate study, particularly to Doctor of Philosophy programs, such as in fiber and polymer science, differ from terminal Bachelor of Science programs primarily in the junior and senior year. While considerable latitude is still possible, there are a number of prescribed courses, the nature of which depends upon the type of graduate study anticipated.

Textile chemistry gives the student fundamental education in chemistry emphasizing the application of this science to textiles. Emphasis on chemical fundamentals adequately prepares exceptional textile chemistry students for graduate study either in pure or applied chemistry. Similarly, students who complete the program in any of the concentrations in textile technology with a high degree of excellence may do graduate study in numerous areas.

Inasmuch as professional textiles work is concentrated in the last two years of the student's program, it is possible for students from junior or community colleges, or other institutions of higher learning, to transfer to the School of Textiles with a minimum loss of time.

INSPECTION TRIPS

For certain textile courses, it is desirable for the student to see the manufacturing process under actual operating conditions. When possible, student groups visit outstanding manufacturing plants. Trip participation is required; transportation costs and other travel expenses, while held to a minimum, are paid by the student.

SUMMER EMPLOYMENT

Job opportunities for summer employment are available for textile students. Placement assistance is available through the school placement office and frequently can be arranged in the student's home community. Qualified students may arrange to receive academic credit of up to three hours per summer not to exceed six hours for faculty-approved summer jobs.

DEGREES

Upon completion of programs in either textile technology or textile chemistry, the degree of Bachelor of Science is conferred.

The School of Textiles offers the following graduate degrees: Master of Textile Technology; Master of Science in textile technology or in textile chemistry; and Doctor of Philosophy in fiber and polymer science. For general requirements consult the Graduate Catalog.

By faculty agreement candidates for the Doctor of Philosophy degree in other schools of this institution may specialize in essentially textile-related subjects. In such cases, research is usually done in Textiles.

THE FOUR-ONE PROGRAM

The School of Textiles has a program which permits a student with a baccalaureate degree from an accredited college or university to complete the requirements for a Bachelor of Science degree in textile technology or textile chemistry after the satisfactory completion of one year of study.

Applicants should have completed mathematics, physics and chemistry comparable to that required in the basic textile technology or chemistry curricula. Under these conditions, the student can complete the degree requirements in two regular semesters and summer school. Students not meeting minimum requirements in sciences or applied mathematics could remove deficiencies in the summer session prior to the fall semester, allowing completion of studies at the end of the normal period or in the following summer sessions.

Each applicant's undergraduate program is considered individually and, in general, a complete transfer of credits is possible.

HONORS PROGRAM

This program offers the exceptional student an opportunity to penetrate deeply into an area of special interest, after completing preparatory studies. Academically-promising entrants to the School, and students who develop academic promise during the freshman year, are assigned to honors advisers and are regarded as honors candidates. Special lectures, discussion groups and seminars in the freshman and sophomore years introduce and reveal the possibilities for future development in the honors program. Towards the end of the freshman year, selected honors candidates are invited to become full members of the honors program. In the sophomore year, with honors adviser consent, honors students may begin to develop programs of strength in a special interest area. This may necessitate the substitution of preferred courses for those normally required. In the junior and senior years the student develops special interests, culminating in an honors thesis. The honors thesis ranges from a scholarly review of a special topic to a discussion of an experimental research problem.

FACILITIES

The Nelson Textile Building houses one of the most modern, best-equipped textile institutions. It includes the Burlington Textiles Library, a division of the D. H. Hill Library and one of the country's best textile libraries.

SPECIAL SERVICES

The School of Textiles offers a number of services and programs which enriches its academic programs.

Textile Research is conducted on a wide variety of problems including some concerns of society with the environment and with health and safety. Frequently the problems are interdisciplinary and involve team effort. Students have an opportunity to participate in the solution to current problems.

Textiles Extension and Continuing Education is vigorously engaged in by all faculty. It serves the needs of the textile industry by disseminating research findings and offering short courses for executive, scientific and supervisory personnel. The two-way exchange in these activities keeps students and faculty informed on all of the latest developments.

Machine Design and Development including well equipped shops, provides engineering assistance to the faculty and students. This department endeavors to remain current with recent engineering advances applicable to textiles and maintains active liaison with industry and the scientific community.

The Office of Student Services is responsible for the placement and financial aid programs of the School of Textiles. The placement function makes available to a potential employer the credentials of our students for permanent and summer employment and in a great number of cases performs equally for alumni.

The financial aid function operates by committee and makes it possible for any North Carolina student to pursue an education in textiles through scholarships, loans or grants as long as one maintains the University's academic and moral standards.

The office also represents the School of Textiles at North Carolina high schools through participating in the North Carolina Guidance and Personnel Association.

The Office of Student Services director is a member of the Executive Committee of the School of Textiles and is, to a great extent, the liaison between the student body and the student government with the administration of the School.

In general, this office is the bridge between academic and extracurricular activities for the students.

OPPORTUNITIES

Technological advances in textile fibers and manufacturing techniques create a demand for textile graduates. For several years, the School of Textiles has had a

demand for more graduates than it could supply. Its graduates have entered the textile industry at salaries equal to or better than those offered in any other industry.

For types of positions open to graduates, see page 181. Placement and interview assistance is available through student affairs and placement.

Textile Chemistry

David Clark Laboratories

Professor H. A. Rutherford, *Head of the Department*

Assistant Professor C. D. Livengood, *Coordinator of Advising*

Professors: K. S. Campbell, D. M. Cates, R. D. Gilbert, G. Goldfinger, R. McGregor; *Professor Emeritus:* R. W. Work; *Adjunct Professors:* A. E. Davis Jr., H. F. Mark, E. M. Pearce, A. Schindler, A. M. Sookne; *Associate Professors:* J. A. Cuculo, T. H. Guion, M. H. Theil, W. K. Walsh; *Associate Professor Emeritus:* A. C. Hayes; *Adjunct Associate Professor:* H. N. Friedlander; *Adjunct Assistant Professors:* K. K. Ghosh, L. A. Graham, W. R. Martin Jr.

The field of textile chemistry embraces a number of disciplines and is concerned, in part, with those industrial processes that constitute the final steps in the preparation of textile materials for the consumer. Common terms applied to these processes are scouring, bleaching, printing, dyeing and finishing. Textile chemistry is also concerned with fiber-forming polymers, both natural and man-made, and how the chemical and physical properties of such materials vary with fiber structure. Students receive a fundamental knowledge of the underlying principles that relate to this derivative field and a perspective that includes the many interacting factors involved in the preparation and conversion of polymeric materials to useful products.

CURRICULA

The department has two undergraduate curricula, referred to as Programs "A" and "B". "A" is for students who plan advanced study in fiber and polymer science. "B" is oriented toward a terminal Bachelor of Science degree. However, pursual of "B" does not mitigate against the student entering a graduate program; by proper choice of electives beginning in the junior year a student may terminate program "B" with essentially the same background as one who takes "A".

Program "A" requires more mathematics and chemistry than "B". The course sequences required are described in footnotes after each program.

Although not indicated specifically in the curricula outlines which follow, the student may choose a minor in a number of different disciplines. Choice of course material is flexible and is made in consultation with the student's adviser. By proper choice of electives a student may in a four-year period complete the requirements for two degrees: textile chemistry and textile technology; textile chemistry and chemistry; and textile chemistry and mathematics. Other combinations are possible, but may require a fifth year of study.

For graduate degrees see pages 12-14 and consult the Graduate Catalog.

FACILITIES

David Clark Laboratories houses offices, classrooms, laboratories and pilot facilities for instruction and research. The departmental radiation laboratory is in Nelson Building. Radiation facilities include a Cobalt 60 source and a 500 KV Electron Accelerator.

Equipment is available for ultra-violet, visible, infrared, nmr and esr spectroscopy, reflectometry, colorimetry, viscometry, chromotography, differential thermal analysis, thermal gravimetric analysis, differential scanning calorimetry, instrumental measurement of color and computer color matching. Common testing equipment used for the evaluation of the physical properties of textile materials and for determining the color-fastness, wash-fastness, etc., of fibers and fabrics is also available. Complete pilot plant facilities allow demonstration of wet-processing operations used in textiles.

UNDERGRADUATE CURRICULUM IN TEXTILE CHEMISTRY

PROGRAM A

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
T 101 Fundamentals of Textiles	2	T 203 Fiber Science I	3
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
MA 102 Analytic Geometry & Calculus I	4	MA 201 Analytic Geometry & Calculus II	4
Physical Education	1	Physical Education	1
	14		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC 303 Textile Chemistry I	2	TC 304 Textile Chemistry II	2
CH 221 Organic Chemistry I	4	T 305 Introduction to Color Science	1
MA 202 Analytic Geometry & Calculus III	4	CH 223 Organic Chemistry II	4
T 220 Yarn Forming Systems	4	PY 205 General Physics	4
or		MA 301 Applied Differential Equations I	3
T 250 Fabric Forming Systems		Humanities or Social Science Elective	3
Free Elective	3	Physical Education (if required)	1
Physical Education (if required)	1		18
	18		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC (CH) 461 Chemistry of Fibers	3	TC 412 Textile Chemical Analysis II	3
PY 208 General Physics	4	ST 361 Introduction to Statistics for Engineers	
T 250 Fabric Forming Systems	4	or	
or		CSC 101 Introduction to Programming	
T 220 Yarn Forming Systems		or	
TC 403 Textile Chemical Technology	3	CSC 111 Algorithmic Languages I	2 or 3
TC 405 Textile Chemical Technology Laboratory	2	CH 431 Physical Chemistry I	3
	16	Humanities or Social Science Elective	3
		TC 404 Textile Chemical Technology	3
		TC 406 Textile Chemical Technology Laboratory	2
			16-17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 315 Quantitative Analysis	4	TC 491 Seminar in Textile Chemistry	1
Textile Chemistry Elective**	3 or 4	Textile Chemistry Elective**	3 or 4
CH 433 Physical Chemistry II	3	Humanities or Social Science Elective	6
Humanities or Social Science Elective	6	Free Elective	6
	16-17		16-17

Total Hours for Graduation 130

** TC 561 Organic Chemistry of High Polymers
** TC (CH) 562 Physical Chemistry of High Polymers—Bulk Properties
** TC 505 Theory of Dyeing
** T 492 Problems in Science and Technology
** TC 401 The Textile Industry and the Environment
** T 506 Color Science
** TC 504 Fiber Formation—Theory and Practice
** T 493 Industrial Internship in Textiles
** TC (CHE) 569 Polymers, Surfactants and Colloidal Materials

UNDERGRADUATE CURRICULUM IN TEXTILE CHEMISTRY

PROGRAM B

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
T 101 Fundamentals of Textiles	2	T 203 Fiber Science I	3
ENG 111 Composition and Reading	3	ENG 112 Composition and Reading	3
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
MA 102 Analytic Geometry & Calculus I*	4	MA 201 Analytic Geometry & Calculus II	4
or		or	
MA 112 Analytic Geometry & Calculus A*	4	MA 212 Analytic Geometry & Calculus B	3
Physical Education	1	Physical Education	1
	14		14-15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC 303 Textile Chemistry I	2	TC 304 Textile Chemistry II	2
CH 221 Organic Chemistry I	4	T 305 Introduction to Color Science	1
MA 202 Analytic Geometry & Calculus III	4	CH 223 Organic Chemistry II	4
or		PY 205 General Physics**	4
MA 114 Topics in Modern Mathematics	3	or	
T 220 Yarn Forming Systems	4	PY 211 General Physics	4
or		Humanities or Social Science Elective	6
T 250 Fabric Forming Systems		Physical Education (if required)	1
Free Elective	3		17-18
Physical Education (if required)	1		
	16-18		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC (CH) 461 Chemistry of Fibers	3	TC 412 Textile Chemistry Analysis II	3
PY 208 General Physics	4	ST 361 Introduction to Statistics for Engineers	
or		or	
PY 212 General Physics	4	CSC 101 Introduction to Programming	
T 250 Fabric Forming Systems	4	or	
or		CSC 111 Algorithmic Languages I	2 or 3
T 220 Yarn Forming Systems		Elective from Schedule A	4
TC 403 Textile Chemical Technology	3	Humanities or Social Science Elective	3
TC 405 Textile Chemistry Technology Laboratory	2	TC 404 Textile Chemical Technology	3
	16	TC 406 Textile Chemistry Technology Laboratory	2
			17-18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 315 Quantitative Analysis	4	TC 491 Seminar in Textile Chemistry	1
Textile Chemistry Elective***	3 or 4	Textile Chemistry Elective***	6
Elective from Schedule A	3	Humanities or Social Science Elective	3
Humanities or Social Science Elective	3	Free Elective	3
Free Elective	3		16
	16-17	Hours for Graduation	129

* One of the following mathematics sequences is required: MA 114, MA 112, and MA 212 or MA 102, MA 201 and MA 202.

** One of the following physics sequences is required: PY 211, 212, or PY 205, 208..

*** Textile Chemistry electives include:

*** TC 561 Organic Chemistry of Polymers
*** TC (CH) 562 Physical Chemistry of High Polymers—Bulk Properties
*** TC 505 Theory of Dyeing
*** TC 401 The Textile Industry and Environment
*** T 492 Problems in Science and Technology
*** T 506 Color Science
*** TC 504 Fiber Formation—Theory and Practice
*** TC (CHE) 569 Polymers, Surfactants and Colloidal Materials
*** TC 493 Industrial Internship in Textiles

Program B Sequences

TX 431 Special Topics in Testing 3
TX 530 Textile Quality Control 3
— 6

CH 431, 433 Physical Chemistry I, II 6

PY 411, 412 Mechanics I, II 6
MA 511, 512 Advanced Calculus I, II 6

CH 331 Introductory Physical Chemistry .. 4
and choice of:
MA 301 Applied Differential Equations I .. 3
CH 441 Colloid Chemistry 3
CHE (TC) 569 Polymers, Surfactants & Colloidal Materials 3
Technical course approved by department head 3
— 7

Textile Technology

Nelson Textile Building

Professor J. F. Bogdan, *Head of the Department*

Professors: A. H. El-Shiekh, D. S. Hamby, S. P. Hersh, P. R. Lord, J. A. Porter Jr.; *Professors Emeriti:* E. B. Grover, J. T. Hilton, W. E. Shinn; *Associate Professors:* E. H. Bradford, W. D. Cooper, C. L. Dyer, R. E. Fornes, T. W. George, B. S. Gupta, J. W. Klibbe, W. K. Lynch, M. H. Mohamed, W. E. Moser, J. E. Pardue, M. L. Robinson Jr., W. C. Stuckey Jr.; *Adjunct Associate Professors:* V. F. Holland, J. C. Lumsden; *Associate Professors Emeriti:* J. G. Lewis, T. G. Rochow; *Assistant Professors:* P. Brown, P. L. Grady, E. E. Hutchison, F. W. Massey, H. M. Middleton Jr., P. A. Tucker Jr.; *Adjunct Assistant Professors:* D. H. Black, D. M. Powell; *Assistant Professor Emeritus:* A. J. Woodbury; *Instructor:* G. W. Smith

The Textile Technology Department instructs students in the theory and fundamental concepts of fiber properties and fiber processing into yarns and fabrics. This is accomplished through the systematic study of the basic properties of both the materials being processed and of the process involved. The department is engaged in research supported by University funds and industrial and governmental sponsors. Faculty, graduate and undergraduate students may participate in the research program.

CURRICULUM

The curriculum the first two years is concerned primarily with the physical sciences, humanities and social sciences, and with limited but important basic studies in textile fundamentals. The major work in textiles is done the junior and senior years.

The textile technology curriculum provides as general an education as possible, while preparing the graduate for a profitable, rewarding textile career. This is accomplished through an integration of the physical and social sciences and the application of these sciences and economics to the field of textiles.

In addition to the wide selection of sciences, the student has the opportunity for diversification within the School of Textiles. The curriculum offers depth in such selected areas as fiber and yarn technology, fabric technology, knitting technology, general textiles and textile management.

For graduate degrees, see pages 12-14.

CONCENTRATIONS

For a student to develop a second field of interest, the Department of Textile Technology offers an opportunity for the selection of a concentration from a discipline outside the department. Not only can strength be developed in a second discipline, but upon completion of the undergraduate work, one may pursue a graduate program of study in textiles or in the concentration discipline.

Selection of the concentration can, in most cases, be delayed until the first semester of the junior year. This permits the student time to determine which field holds the greatest interest. This timing is also appropriate for the transfer student from both the N. C. State campus and from other schools such as the community colleges, since most or all of the work in the other school can be applied to the requirements of the first two years of study in the department. If the transfer student has completed two full years at another institution, the amount of prerequisite work is minimized, since the majority of the major and minor studies are concentrated in the junior and senior years.

FACILITIES

Textile Technology has laboratory areas for processing of short staple fibers, long staple synthetic fibers, throwing and texturizing continuous filament yarns. Laboratories for the study of the formation of woven, knitted and nonwoven fabrics including tufting and yarn preparation systems are available. The knitting laboratories include a hosiery section, circular and double knitting, warp and flat knitting, and knit goods finishing. The department has extensive facilities for physical testing of fibers, yarns and fabrics. A textile physics laboratory includes equipment designed for specialized problems related to textiles.

TEXTILE TECHNOLOGY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II or CH 107 Principles of Chemistry	4
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
Humanity-Social Science Elective	3	MA 112 Analytic Geometry & Calculus A or MA 201 Analytic Geometry & Calculus II	4
MA 111 Algebra and Trigonometry* or MA 102 Analytic Geometry & Calculus I	4	T 220 Yarn Forming Systems	4
T 101 Fundamentals of Textiles	2	Physical Education	1
Physical Education	1		16
	17		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Humanity-Social Science Elective	3	CSC 200 Introduction to Computers & Their Uses	3
MA 212 Analytic Geometry & Calculus B or MA 202 Analytic Geometry & Calculus III	3 or 4	Humanity-Social Science Elective	3
ST 361 Introduction to Statistics for Engineers	3	PY 205 General Physics or PY 211 General Physics	4
T 203 Fiber Science I	3	TX 211 Fiber Science II	3
T 250 Fabric Forming Systems	4	TX 330 Textile Measurements & Quality Control	4
Physical Education	1	Physical Education	1
	17-18		18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Humanity-Social Science Elective	3	TX 340 Principles of Knitted Fabric Structures	5
PY 212 General Physics or PY 208 General Physics	4	TX 350 Woven Fabric Structures	5
TC 301 Technology of Dyeing & Finishing	4	TX 380 Management & Control of Textile Systems	3
TX 320 Design & Control of Staple Yarn Systems	5	Concentration Hours (Programs A, B, C)	3
	16		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Humanity-Social Science Elective	3	Humanity-Social Science Elective	3
TX 460 Physical Properties of Textile Fibers or		Concentration Hours (Programs A, B, C)	6
TX 560 Structural & Physical Properties of Fibers	3	Free Electives	6
Concentration Hours (Programs A, B, C)	6		15
Free Elective	3	Total Hours for Graduation	130
	15		

* MA 114 may, under certain circumstances, be substituted for MA 111.

The mathematics sequence for qualifying students shall be MA 102, 201 and 202. Eighteen credit hours of humanity-social science electives are required. These 18 hours are to include three credit hours of English and EC 201. Students are encouraged to take a minimum of two courses in the areas chosen to fulfill the humanity-social science requirement. The choice of course sequence and scheduling will be planned by the faculty adviser and the student.

PROGRAM A

Program A is designed for the student interested in pursuing advanced studies in the basic and applied sciences. The textile courses in the concentration emphasize the physics and mechanics of textile structures and materials. The program is ideally suited for, but not limited to, those interested in pursuing graduate studies in the Master of Science or Doctor of Philosophy programs. The actual sequence of courses constituting the 15 hour concentration is based upon student interest with adviser approval. Typical courses from which the concentration may be structured are: MA 301, MA 511, ESM 301, PY 411, PY 412, PY 413, T 500, TC 461, TX 561. The student selects at least six hours of 400 or 500 level textile courses.

PROGRAM B

Program B, consisting of 15 hours, is based upon a background in basic economics and is designed to develop an understanding of management control systems, decision-making theories and marketing and distribution systems. Six hours of course work must be selected from ACC 260, EC 420, 307, 326, 431, and 332, TX 586. The student would be expected to select at least six hours of 400 or 500 level textile courses.

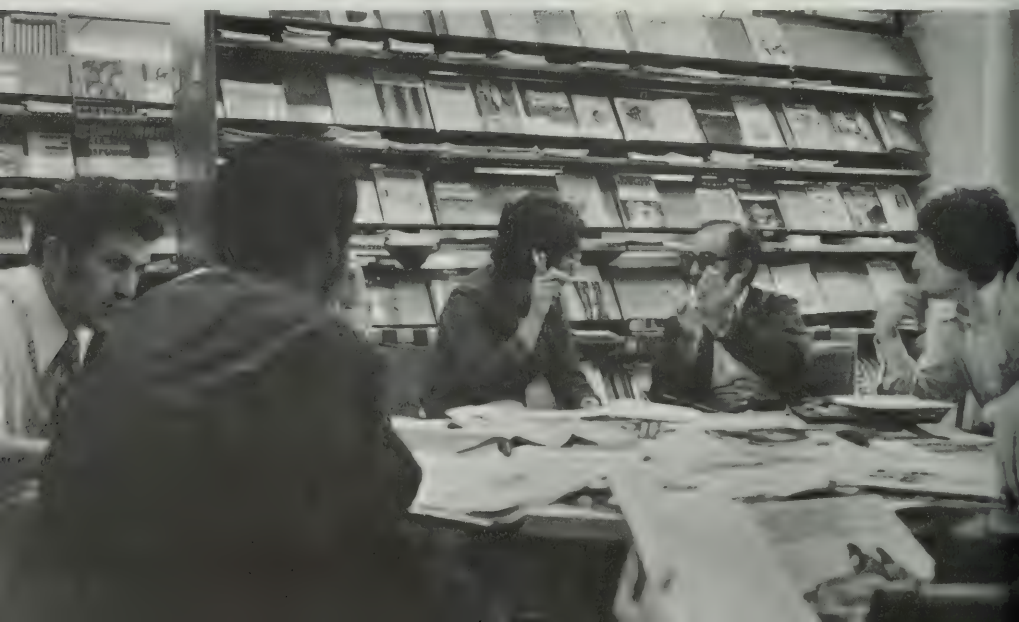
PROGRAM C

Program C allows students to elect advanced courses in the field of textiles. These courses may be selected from the elective offerings by the School of Textiles and may be used to develop in-depth study in yarn forming, fabric forming, microscopy, quality control, textile chemistry or combinations of these areas.

For those students interested in developing a sequence of courses in a discipline outside of the School of Textiles, these 15 hours may be used, in whole or in part, for a sequence of courses comprising the program of study planned by the student and faculty adviser and approved by the Head of Textile Technology.

Laboratory work is an integral part of a chemist's training for improving and developing materials and controlling our environment.

The specialized Textiles Library is a branch of the D. H. Hill Library which also maintains branches in Design and Forest Resources.



University Studies

Harrelson Hall

Instructor C. L. Stalnaker, *Acting Head*

Professors: J. R. Lambert Jr., J. C. Wallace; *Associate Professor:* D. Huisingh; *Assistant Professor:* R. L. Hoffman

University Studies is an academic unit responsible for interdisciplinary programs dealing with contemporary issues and problems. Courses are taught by teams of faculty drawn from the Division and from the academic disciplines relating to the problems or issues under consideration. These courses are open without prerequisites to students in all curricula.

Military Education and Training

DEPARTMENT OF MILITARY SCIENCE (ARMY ROTC)

Professor: Col. R. E. Lenzner; *Instructors:* Lt. Col. R. E. Gatti, Maj. B. J. Baucom, Capt. G. W. Johnson, Capt. G. N. Edgar.

DEPARTMENT OF AEROSPACE STUDIES (AIR FORCE ROTC)

Professor: Col. D. F. First; *Instructors:* Maj. D. M. Ware, Maj. J. D. Wingfield, Capt. G. L. Nordyke

The Reserve Officers' Training Corps designates University students enrolled in the Department of Military Science (Army ROTC) or in the Department of Aerospace Studies (Air Force ROTC). These departments are separate academic and administrative subdivisions of the institution.

The mission of the Army ROTC program is to produce well-educated commissioned officers in sufficient numbers to meet Army requirements.

The mission of the Air Force Reserve Officers' Training Corps (AFROTC) is to recruit and, through a college campus education program, commission second lieutenants in response to Air Force active duty requirements.

COURSE OF INSTRUCTION

Army ROTC—The program of instruction for the Army ROTC consists of a two-year basic course and a two-year advanced course. Also available is a two-year program designed for junior college graduates and students at four-year colleges who were unable to take ROTC during their first two years of college.

Air Force ROTC—The program of instruction consists of a two-year general military course, a field training course, and a two-year professional officer course.

Students desiring to enter either the Army or Air Force two-year program should contact the Military Science Department, Room 154, Reynolds Coliseum, or the Aerospace Studies Department, Room 145 Reynolds Coliseum, before the start of the spring semester of their sophomore year.

The Army and Air Force ROTC units conduct a flight instruction program. A limited number of highly qualified Army cadets participate and receive 36½ hours of flying in light aircraft. All Air Force ROTC cadets who are qualified and have volunteered for active duty pilot training receive 25 hours of flying. Both programs include ground school training. Successful completion of the Army program may qualify cadets for a Federal Aviation Agency private pilot's certificate.

Satisfactory completion of the advanced courses qualifies a student for commissioning as a second lieutenant in the Army or Air Force Reserve upon graduation from the University.

SELECTION

Army ROTC—The selection of advanced-course students is made from applicants who are physically qualified and who have above average academic and military records. Veterans who have one year or more of service in the Armed Forces are eligible for enrollment in the Army ROTC advanced course upon reaching their junior year, provided they are in good academic standing, physically qualified, have not reached their 27th birthday and are selected by the PMS and the University administration.

Air Force ROTC—A student enrolled in the Air Force ROTC may pursue a four-year program or a two-year program. Both offer the opportunity for receiving an AFROTC scholarship.

Students, to meet enrollment requirements for the professional officer course, must achieve a qualifying score on the Air Force Officer Qualification Test (AFOQT), meet necessary physical requirements and must have good academic records. Qualified veterans desiring a commission through an Air Force ROTC program complete the two-year advanced program and, in most cases, attend four weeks of field training. Non-veterans must complete the two-year general military course, the two-year professional officer course, and attend four weeks of field training. Non-veterans may elect to successfully complete six weeks field training and the two-year professional officer course in lieu of the above four-year program. Cadets must complete either program before their 30th birthday to qualify for a commission.

Credit—Credit is allowed for work at other institutions having an ROTC unit established in accordance with the provisions of the National Defense Act and regulations governing the ROTC.

FINANCIAL AID

Students in the Army basic or Air Force general military course, other than scholarship students, receive no monetary allowance. For summer training of four to six weeks, students receive pay and travel allowance. All Army and Air Force students in their last two years receive a subsistence allowance of $100 (tax free) per month. Scholarships which pay for tuition, all fees and textbooks are available to both Army and Air Force cadets.

Army ROTC—One-, two-, three- and four-year scholarships are available to selected Army ROTC students who are strongly motivated toward a career in the Army.

Air Force ROTC—A limited number of selected students enrolled in the Air Force ROTC program may qualify for two-, three- and four-year scholarships.

Uniforms—Uniforms for Army and Air Force ROTC are provided by the University from commutation funds paid by the Federal government.

ORGANIZATION

Army—The Army ROTC unit at N. C. State consists of a cadet battalion, commanded by a cadet lieutenant colonel, and comprised of a headquarters company and lettered companies. The cadet lieutenant colonel and all other cadet officers are selected from students enrolled in the second year advanced course. Cadet sergeant majors, first sergeants and sergeants first class are appointed from students enrolled in the first year advanced course. Certain specially selected students in the second year basic course also are appointed as cadet non-commissioned officers. Cadet officers and non-commissioned officers conduct all drill instruction with supervision by the University's Army faculty.

Air Force—The Air Force ROTC unit is organized as a cadet group (commanded by a cadet colonel) with an appropriate number of squadrons; the squadrons are composed of flights and squads. The group, squadron and flight commanders and their staff are cadet commissioned officers and are selected from cadets enrolled

in the professional officers course. All other positions are held by cadet non-commissioned officers who are selected from general military course cadets. Cadet officers and non-commissioned officers plan and conduct the cadet group operation with AFROTC faculty supervision.

DISTINGUISHED STUDENTS

The University names outstanding students of the Army ROTC and Air Force ROTC as Distinguished Military Students or Distinguished Air Force ROTC Cadets. These students may, upon graduation, be designated Distinguished Military Graduates or Distinguished Air Force ROTC Graduates. Distinguished Military Graduates may be commissioned in the Regular Army.

Graduate School

R. J. Peeler, *Vice Provost and Graduate Dean (Acting)*

Graduate instruction at North Carolina State University is organized to provide opportunity and facilities for advanced study and research in the fields of agriculture and life sciences, architecture, design, engineering, forestry, certain disciplines in the School of Liberal Arts, physical and mathematical sciences, technological education and textiles. The purpose of these graduate programs is to develop in advanced students a more adequate comprehension of the requirements and responsibilities essential for independent research investigation. In all the graduate programs emphasis is placed upon a high level of scholarship rather than upon the satisfaction of specific course or credit requirements.

Exceptional facilities for graduate study are provided at North Carolina State University. New buildings include modern well-equipped laboratories for graduate study in many areas.

For a list of graduate degrees offered at North Carolina State University, see pages 12-14. Consult the Graduate Catalog for details on programs and admission.

Centralized Computational Resources

North Carolina State University is one of the three universities owning the Triangle Universities Computation Center (TUCC). This facility is located in the Research Triangle Park 15 miles from Raleigh. The other participating universities are the University of North Carolina at Chapel Hill and Duke University at Durham.

The central equipment located at TUCC is an IBM System 370, Model 165 with 3.0 million characters of memory. In addition, 225 million bytes of disk storage are available as well as extensive teleprocessing equipment for communication with member universities and other institutions throughout the State.

Each university has one high-speed terminal and several medium and low-speed devices located in key position on campus. The input-output terminals are connected to the Model 165 by telecommunication lines.

The high-speed terminal at N. C. State is an IBM 360, Model 40 located at the Computing Center in Nelson Textile Building. It provides communication with TUCC and simultaneously processes many of the administration's data processing applications. Other terminals, including several medium-speed facilities and many typewriter and cathode ray tube devices, are located on campus. They and the Model 40 are used for faculty and student research and for instruction in credit and noncredit courses. Each of the eight schools and an increasing number of their departments find these facilities to be an important tool in the student's total educational process.

The University's Systems Aanlysis and Control Center provides centralized computing facilities for data acquisition, control, and simulation. The center maintains a versatile hybrid facility for faculty and student use. There are 17 hybrid simulation terminals for instructional use. A GT 11-40 is available for graphics, research and instruction. Various mini-computers and small analog computers in this center are for instruction and research.

University Extension

1911 Building

W. L. Turner, *Vice Chancellor for Extension and Public Service*

L. H. Hammond, *Assistant Vice Chancellor for Extension and Public Service*

M. F. Hester, R. A. Mabry, *Assistants to the Vice Chancellor for Extension and Public Service*

The University administration is linked to the faculty of the various schools and with clientele groups throughout the state through the Vice Chancellor for Extension and Public Service, extension field staff, and through advisory or liaison groups. The University's overall extension program is coordinated through the Vice Chancellor for Extension and Public Service who administers program development, management of interschool and interinstitutional extension programs and projects and provides staff assistance for campus wide extension programs.

DIVISION OF CONTINUING EDUCATION

R. A. Mabry, *Acting Director*

Associate Directors: J. Porter, D. B. Stansel; *Assistant to the Director:* H. H. Ethridge; *Continuing Education Specialists:* N. B. Broyles, K. R. Crump, J. F. Cudd Jr., J. B. Gordon, D. S. Jackson, H. G. Walker Jr.

The Division of Continuing Education of N. C. State is the statewide adult education service linking the University, its scholars, research, and resources with the people and communities of the State. The programs vary in length and format from one-day conferences and short courses to regular semester-length classes and educational television.

The Division's programs are designed to meet the needs of any adult who can benefit from university-level study. The instructional staff consists of University faculty, from N. C. State and other institutions, and authorities in specific fields.

Only those programs appropriate to the standards of scholarship and instruction of N. C. State are offered. Both credit and noncredit programs are offered on the University campus, in communities throughout the State and by correspondence instruction.

Correspondence Courses—The Division offers more than 50 different courses through its office of Independent Study-Correspondence. Credit courses are offered in 15 subject areas and in high school review courses in English and mathematics.

Credit and Noncredit Evening Classes—The Division offers, during the fall and spring semesters, a series of credit and noncredit courses on the University campus. The credit courses are sponsored and taught by the University's academic departments and are generally conducted in the late afternoon and evening. These courses are offered to the already occupied mature person who is unable to attend classes during daytime hours. Approximately 110 courses in a variety of subject areas are given each semester. The noncredit classes are designed for cultural and professional enrichment.

Off-Campus Credit Courses—Extension classes are offered throughout the State. These classes are mainly on a need basis or by request from organizations or special

groups. Courses are available in almost all subject matter areas from engineering to the social sciences. In 1973 the Division administered 82 credit classes in 31 different locations with registrations totaling over 1,300.

Short Courses, Institutes, and Conferences—Short courses, institutes and conference programs, more than any others, mark the University's efforts to meet its Land-Grant tradition of providing education to all the people. The scope of the programs include: agriculture, engineering, forestry, textiles, the physical sciences, economics, management, communications, education, and recreation. During 1973-74 there were 194 courses offered with registrations totaling over 12,013.

The University awards Continuing Education Units to participants in qualified programs. Continuing Education Units are a part of a nationwide recording system to provide a uniform measure of attainment in noncredit educational programs. One CEU at N. C. State is defined as "ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction, and qualified instruction."

SUMMER SESSIONS

C. F. Kolb, *Director*

The Summer Sessions at N. C. State offer an extensive education program to meet the varied needs and interests of almost 8,000 students who come to the campus each summer.

Each of the University's eight schools—represented by more than 55 different departments—offers instruction in over 600 courses, more than 40 percent of which are at the graduate level. A faculty of more than 400 teachers participates in programs for summer study. Six of the eight schools offer regular courses during the two five-week terms. Design offers one nine-week program. Forest Resources conducts a summer camp for sophomores and two five-week practicums. In addition, numerous special programs and institutes are offered during the summer. Summer courses and special programs meet the needs of undergraduate and graduate students of N. C. State and visiting students pursuing degrees from other institutions.

For information regarding summer activities write: Director of Summer Sessions, Box 5125, Raleigh, North Carolina 27607.

COURSE DESCRIPTIONS

In a typical course description, the semester hours of credit, the number of actual lecture and laboratory hours of meeting per week, and the term or terms in which the course is offered are shown in this manner: 2(1-2) F, S, Sum. or 1-3 F, S, Sum.

The 2 indicates the number of semester hours credit given for satisfactory completion of the course. The (1-2) indicates that the course meets for one hour of lecture and for two hours of laboratory work each week. The 1-3 indicates a minimum of 1 and a maximum of 3 semester hours credit can be earned. This is to be arranged with the instructor. The F designates the course is to be given the fall semester. Likewise, S designates spring; Sum, summer.

Abbreviations used in the course descriptions are: CI, consent of instructor; grad., graduate; undergrad., undergraduate; sr., senior; jr., junior; soph., sophomore; fr., freshman; preq., prerequisite; coreq., corequisite; lab., laboratory; lect., lecture; and alt. years, alternate years.

Waiver of prerequisites is at the discretion of the instructor.

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Accounting

(Also see Economics.)

ACC 260 Accounting I—Concepts of Financial Reporting. 3(3-0) F,S. Financial reporting concepts, the information generating process, income measurement, resource valuation, corporate equity measurement, reporting practices, and the interpretation and analysis of financial statements. Introduction to internal controls and merchandising and manufacturing inventories.

ACC 261 Accounting II—Financial Information Systems. Preq: ACC 260. 3(3-0) F,S. Information systems and their generation of financial data for reporting purposes. Includes consideration of the reporting practices related to noncorporate entities, financial statement structures and classifications, and internal controls.

ACC 262 Managerial Uses of Cost Data. Preq: ACC 260. 3(3-0) F,S. Managerial uses of cost data in planning, controlling, and evaluating organizational activities and in making business decisions. Includes consideration of budgeting, cost behavior, product costing and pricing, and an introduction to production cost.

ACC 360 Financial Reporting Theory and Practice I. Preq: ACC 261. 3(3-0) F. The preparation of working papers and financial statements, the valuation and reporting problems relating to cash, receivables, inventories, investments, and tangible and intangible assets. Consideration of related professional pronouncements.

ACC 361 Financial Reporting Theory and Practice II. Preq: ACC 360. 3(3-0) S. The valuation and reporting problems relating to current and non-current liabilities, and corporate and non-corporate owners' equities. Includes cash and fund-flow reporting, the analysis of financial statements, the impact of price-level changes on financial reporting, and professional literature.

ACC 362 Production Cost Analysis and Control. Preq: ACC 262. 3(3-0) F. Managerial reporting practices for producing activities, the development and use of cost standards and budgets, and the cost measurement of productive inputs for units of productive outputs. Managerial use of cost data in analyzing, planning, and controlling business activity. Consideration of information systems and internal controls.

ACC 460 Specialized Financial Reporting Theory and Practice. Preq: ACC 361. 3(3-0) F. The specialized valuation and reporting problems relating to consolidated financial statements, business combinations and reorganizations, governmental and nonprofit organizations, home office and branch relationships, foreign affiliates, estates and trusts, and business firms experiencing financial difficulties. Study of related professional publications.

ACC 464 Income Taxation. Preq: ACC 260. 3(3-0) F,S. Federal and state income tax laws relating to individuals and other taxable or reporting entities, the measurement and reporting of taxable income, and basic research in taxation. Introduction to tax planning.

ACC 466 Examination of Financial Statements. Preq: ACC 361. 3(3-0) S. The objectives, standards, procedures, problems, practices and theory of financial statement examination as performed by independent public accountants. The professional standards and ethical codes, the features of information systems and internal control, and other professional topics. Extensive use of professional literature and authoritative pronouncements.

ACC 468 Professional Accountancy Resumé. Preqs: ACC 362 and 460. 3(3-0) S. A review and summation of the theory and practice of financial reporting and professional accountancy, as they relate to preparation for the certified public accountant's examination, covering both their general and specialized topics.

Agriculture and Life Sciences

GENERAL COURSES

ALS 103 Introductory Topics in the Agricultural and Life Sciences. 1(1-0) F. The scope and objectives of a university education with emphasis on the sciences, particularly as related to biology and agriculture. Guest lectures and departmental visits.
Glazener, Craig

ALS 299 Superior Student Seminar. Preq: Fr. and soph. honor students. 1, Maxmum 2. S. Seminar program open only to fr. and soph. students in the honors program. Participation is by invitation.

ALS (LA) 490 International Seminar. Preq: Jrs. and srs., upperclassmen interested in international affairs. 1(1-0) S. A weekly series of seminars on the economic and social aspects of developing countries.

ALS 499 Honors Student Research. 1-3, Maximum 6. S. A research program open only to jr. and sr. students in the honors program. Participation is by invitation.

AC 311 Communication Methods and Media. Preq: ENG 112. 3(3-0) S. Written, oral and visual techniques of communjcations; a survey of the channels of communications available; principles and techniques for using these channels individually or combined into a publicity, promotion, public relations, information or advertising program.
Carpenter

Animal Science

FOR UNDERGRADUATES

ANS 200 Introduction to Animal Science. 4(3-3) F,S. The fundamental principles of dairying and meat animal production. The importance of dairy and meat products in the diet and in the economy.
Goode, Rakes

ANS 204 Livestock Feeds and Feeding. 3(2-3) S. An introduction to applied animal nutrition, including the structure and function of the digestive tract, the nutrient value and classification of feedstuffs and the nutrient requirements and formulation of livestock rations.
Leatherwood

ANS (FS,NTR) 301 Nutrition and Man. Preq: Two years of college work. 3(3-0) F,S. Basic principles relating to practical problems in the provision and utilization of nutrients for individuals and populations under various environmental conditions. Wise

ANS 302 Selecting Dairy and Meat Animals. 2(0-6) S. Market classes and grades of beef cattle, swine and sheep are used to study live animal-carcass value interrelationships. Breed histories, pedigrees and desirable characteristics of dairy cattle, meat animals and quarter horses. Harvey, Wilk

ANS 308 Advanced Selection of Dairy and Meat Animals. Preq: ANS 302. 1(0-3) F. Includes intensive practice in selecting market and purebred livestock. Harvey, Wilk

ANS 401 Reproductive Physiology. Preq: ZO 421. 3(2-3) S. Current concepts of physiology related to mammalian reproduction. Emphasis on physiological processes, how they are influenced by external forces and their importance in reproductive performance. Myers, Johnson

ANS 402 Beef Cattle Management. Preq: ANS 204. 3(2-3) S. Modern management practices emphasizing the application of principles of genetics, ruminant nutrition and animal health to cow-calf programs and to stocker and feeder cattle operations. Harvey

ANS 403 Swine Management. Preq: ANS 204. 3(2-3) S. The economic, nutritional, genetic, physiological and managerial factors affecting the operation of modern swine enterprises. Clawson

ANS 404 Dairy Cattle Management. Preq: ANS 204. 3(2-3) S. Dairy farm management, including feed acquisition and utilization, breeding and selection, health and sanitation, herd replacements and dairy farm buildings. Emphasis upon the consequences of management alternatives and the importance of herd and farm business records. Davenport

ANS 405 Lactation. Preq: ZO 421. 3(2-3) F. Gross and microscopic anatomy of the developing and the mature mammary gland. Physiological processes involved in milk secretion and the removal of milk from the gland. Research problem required. Mochrie

ANS 406 Sheep Management. Preq: ANS 204. 3(2-3) F. The economic, genetic, nutritional, physiological and managerial factors affecting the operation of the modern sheep enterprise. (Offered F 1975 and alt. years.) Goode

ANS (FS) 409 Meat and Meat Products. 3(2-3) S. (See food science page 269.)

ANS 410 Horse Management. 3(2-2) F. Application of fundamentals of selection, nutrition, breeding and animal health to light horses. Managerial details are covered. Barrick

ANS 411 Breeding and Improvement of Domestic Animals. Preq: GN 411. 3(2-2) F. Genetic principles are stressed in relation to the improvement of economically important domestic animals. Emphasis on the specific requirements of breeding plans for individual species. McDaniel

ANS (NTR,PO) 415 Comparative Nutrition. Preq: CH 220 or 221. 3(3-0) F. Fundamentals of animal nutrition, including the classification of nutrients; the

requirement and general metabolism by different species for health, maintenance, growth and other productive functions. Ramsey, Donaldson

ANS (NTR) 416 Quantitative Nutrition. Preq: BCH 351 or equivalent. 3(1-6) F. Quantitative principles are applied to nutrition by using animals and microorganisms in practical experiments. Jones

ANS 490 Animal Science Seminar. 1(1-0) S. Review and discussion of special topics in all phases. Porterfield

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ANS (PHY) 502 Reproductive Physiology of Vertebrates. Preq: ZO 421 or CI. 3(3-0) S. Emphasis upon discussion of mechanisms which control reproductive processes. Those which are species-limited are compared with those shared by all. Current knowledge of some subsystems is investigated in detail and others are referred to in reviews of well-documented research. Ulberg

ANS (VET) 505 Diseases of Farm Animals. 3(3-0) F. (See veterinary science, page 383.)

ANS (GN) 508 Genetics of Animal Improvement. Preqs: GN 411, ST 511. 3(3-0) S. Emphasis upon the utilization of basic principles of population and quantitative genetics in animal improvement. Factors affecting genic and genotypic frequencies and methods of estimating genetic and non-genetic variance, heritabilities and breeding values. The roles of mating systems and selection procedures in producing superior genetic populations. Robison

ANS 520 Tropical Livestock Production. Preq: Six hours of ANS at 400-level or CI. 3(3-0) S. Modern principles of feeding, genetics, forage production and management are applied to improvement of meat and dairy animals in tropical, subtropical and high-altitude environments. Considers biological and socio-economic constraints to development of livestock industry. Discussion of climatic effects on production applies to U. S. conditions and to developing tropical countries.
W. L. Johnson

ANS (PHY) 580 Mammalian Endocrine Physiology. Preqs: BCH 351, ZO 421. 3(3-0) F. Detailed discussions of the mammalian endocrine system emphasizing the functional aspect, chemistry and mode of action of specific hormones secreted by major endocrine glands. Modern biochemical and physiological principles of hormonal integrations and neuroendocrine integration. B. H. Johnson

ANS 590 Topical Problems in Animal Science. Maximum 6 F,S. Special problems are selected or assigned. Graduate Staff

FOR GRADUATES ONLY

ANS (GN) 603 Population Genetics in Animal Improvement. 3(3-0) F.

ANS (PHY) 604 Experimental Animal Physiology. 4(2-4) F.

ANS (ST) 622 Principles of Biological Assays. 3(3-0) S.

ANS (BCH) 653 Mineral Metabolism. 3(3-0) F.

ANS 690 Seminar in Animal Nutrition. 1(1-0) F,S.

ANS 699 **Research in Animal Science.** Credits Arranged F,S.

Anthropology

(Also see Sociology.)

FOR UNDERGRADUATES

ANT 251 Physical Anthropology. 3(3-0) F,S. The evolution of man and his antecedents is illustrated by a study of fossil materials from Africa, Europe and the Far East. The course emphasizes the process of evolution, morphology, classification systems, dating techniques, the beginnings of culture and communication, and human variation, including contemporary races; and increases awareness of man as a culture-bearing primate.

ANT 252 Cultural Anthropology. 3(3-0) F,S. Through the study of nonliterate peasant and complex societies, an overview is given of the history of ethnological theory, methods in cultural anthropology, ethnographic field-work, personality and culture, the socialization process, cultural ecology, structural-functional analysis, language, art and society, kinship systems, political and economic anthropology, religions, magic and witchcraft, and social and cultural change.

ANT 305 Peoples of the World. 3(3-0) F,S. Introductory course in ethnology which develops a general understanding of the culture of primitive peoples, peasants, and of modern man. Specific problems are investigated such as cultural ecology, evolution, subsistence practices, nutrition, and economic development.

ANT 405 Indians of North America. Preq: Six hours ANT and/or SOC. 3(3-0) S. Analyzes North American Indian and Eskimo life, including: 1) theories of provenience and an overview of selected prehistoric cultural manifestations; 2) peoples and cultures at the time of European contact; 3) the nature and concomitants of contacts between native Americans and whites; 4) examines contemporary Indian and Eskimo problems relating to identity, accommodation, assimilation and self-determination.

ANT 406 Peoples and Cultures of South America. Preq: Six hours ANT and/or SOC. 3(3-0) F. Introduces student to the types of social groups found in South America, and explores their cultural development from prehistoric times to the present. Analyzes problems facing their developing nations from an anthropological point of view, stressing the interrelationships between national decision-making processes and the small community.

ANT 416 Field Methods in Cultural Anthropology. Preq: Six hours ANT. 3(3-0) F,S. 1) Provides a systematic experience with anthropological field techniques, i.e., community mapping; household census; kinship analysis; life-history recording; participant observation; inventory of material culture; child rearing observation. 2) Familiarizes student with conventional anthropological field tools, i.e., tape recorder, motion picture camera, still camera, fieldwork journal, unstructured interview. 3) Through textbooks and supplementary reading, provides a view of anthropologists' reports of their own field methods and problems encountered.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ANT 511 Anthropological Theory. Preqs: Six hours SOC, ANT 252 and 305, or equivalent. 3(3-0) F. Approaches theory from both an historical and contemporary point of view. Emphasizes the key anthropological concept of culture and its significance for understanding man and his works.

ANT 512 Applied Anthropology. Preq: ANT 252 or CI. 3(3-0) F,S. Includes a review of the historical development of applied anthropology and a study of anthropology as applied in government, industry, community development, education and medicine. The processes of cultural change are analyzed in terms of the application of anthropological techniques to programs of developmental change.

Architecture

ARC 300 Historic Architecture Research. Preq: DN 202. 2 F,S. Research and the recording of sites, monuments, buildings, or artifacts of historical interest.
Staff

ARC (ESM) 315 Architectural Mechanics I. 3(2-3) F. (See engineering science and mechanics, page 259.)

ARC (ESM) 316 Architectural Mechanics II. 3(2-3) S. (See engineering science and mechanics, page 259.)

ARC 331 Environmental Building Systems. 2(1-3) F,S. Establishment and development of concept of building as an environmental control mechanism, i.e., as barrier between natural environment and man's activities and needs. Investigation of environmental factors, building materials, their properties, processes of production, principal systems of enclosure, economic factors, and legal controls. Aho

ARC 332 Environmental Control Systems. 2(1-3) F,S. Basic systems used to control environment: air, heat, light, sound, sanitation. Emphasis upon principles and conceptual understanding of each system through comparative analysis. Investigation of each system's effect on architectural form. Barnes

ARC 400 Intermediate Architectural Design (Series). Preqs: DN 202 or equivalent or consent of department. 4(1-9) F,S. Design investigations aimed at developing understanding of major issues confronting contemporary architect and at expanding of problem-solving abilities in architectural design. Students must complete four semesters. Several vertically organized workshops offering a wide range of program emphases are available. Staff

ARC (CE) 415 Architectural Structures I. 3(2-3) F. (See civil engineering, page 222.)

ARC (CE) 416 Architectural Structures II. 3(2-3) S. (See civil engineering, page 222.)

ARC 421 Origins and Development of Contemporary Architecture. Preq: Jr. standing. 3(3-0) F,S. A survey and critical examination of modern architecture from its origins in 19th century philosophy and technology to the most recent developments in world architecture. Kamphoefner

ARC 431 Industrialized Systems Building. Preq: ARC 331. 2(1-3) F,S. Analytic study of mass-produced building systems examining implications, limitations, and potentials. Analysis includes design, factory processes, distribution methods, fabrication, erection, economic analysis. Staff

ARC 432 Climate Control Systems and Design. Preq: ARC 332. 2(1-3) F. Mechanical systems used for heating, cooling, ventilating, conditioning interior of buildings. Analysis and design of climate control system for small-scale building undertaken.
Barnes

ARC 433 Illumination Design. Preq: ARC 332. 2(1-3) S. Examination of interior and exterior lighting design, including vision, color, sources, and control. Barnes

ARC 441 Design Methods. 2(2-0) F,S. Description, comparisons, testing of methods available in architectural design with emphasis on problem-solving techniques. Staff

ARC 491 Special Projects in Architecture. Preq: Jr. standing. 1-4 F,S. Special projects investigation by interdisciplinary groups or individuals. Staff

ARC 495 Special Problems in Architecture. Preq: Jr. standing. 1-3 F,S. Special architectural problems under direction of faculty member on tutorial basis. Staff

ARC 499 Architecture Seminar. Preq: Consent of department. 1-3 F,S. Presentations, discussions of special areas in architecture and allied design fields. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ARC 501, 502 Advanced Architectural Design I, II. Preqs: (501) 16 credits of ARC 400 or equivalent; (502) ARC 501. 6(3-9) F,S. Architectural design investigations of large-scale architectural problems having complex functional, social, economic implications; special emphasis on problem identification, program formulation and application of advanced design methods. Graduate Staff

ARC 511 Professional Practice I. Preq: Fourth year standing. 2(2-0) F. Evolution of architecture as a modern practical profession. Obligations of the profession to society and to itself. Legal and ethical position of practicing architects. Comparative study of documents. Architect's working organization. Emerging office practice techniques. Graduate Staff

ARC 512 Professional Practice II. Preq: Fourth year standing. 2(2-0) S. Standard documents and emerging techniques of practice, emphasizing principles and improved techniques of writing construction specifications; interrelationship of contract documents; comparative study of techniques of controlling competitive bidding. Graduate Staff

ARC 521, 522 Advanced Architectural Structures I, II. Preqs: (521) ARC (CE) 416; (522) ARC 521. 3(3-0) F,S. Gravity and nongravity loads on structures; comparative behavior of structural materials; comparative behavior of simple structural systems; approximate and exact analysis procedures as applied to systems; principles of approximate and exact design in timber, steel, and reinforced concrete; architectural/structural/mechanical compatibility in systems; basic principles of foundation analysis and design. Brantly

ARC 531, 532 Advanced Building Technology I, II. Preqs: ARC 331, 332. 2(1-3) F,S. Synthesis of building science courses. Material assemblies in practical application, dimensional characteristics of mechanical and construction systems for building and special projects in selected areas of building science. Graduate Staff

ARC 551 Research Methods in Architecture. Preq: Grad. standing. 2(2-0) F,S. Seminar on quantitative methods from various disciplines. Analysis of techniques and instruments appropriate in solving problems involving scaling, measurement, modeling, and gaming within the physical environment. Graduate Staff

ARC 591, 592 Advanced Topics in Architecture I, II. Preq: Advanced or grad. standing in Design or departmental approval. 1-4 F,S. Investigations of specialized aspects of architecture for advanced undergraduate and graduate architecture students. Graduate Staff

FOR GRADUATES ONLY

ARC 601, 602 Advanced Architectural Design III, IV. 6(3-9) F,S.

ARC 621, 622 Advanced Architectural Structures III, IV. 2(1-3) F,S.

ARC 691, 692 Special Topics in Architecture. 1-6 F,S.

Art

ART 200 The Visual Arts in Contemporary Life. 3(3-0) F,S. For undergraduates who are not majors in Design. Painting, sculpture, crafts, the useful arts of commerce, and the aesthetic nature of man are studied to increase understanding of man's artistic achievements and relate creative experience to every day life. Staff

Biochemistry

FOR UNDERGRADUATES

BCH 351 Elementary Biochemistry. Preq: CH 223. 3(3-0) F,S,Sum. A survey course to introduce basics of biochemistry and the various areas of research the discipline encompasses. Armstrong, Horton, Main

BCH 352 Elementary Biochemistry Laboratory. Preq: BCH 351 (may be taken concurrently). 1(1-2) S.

BCH 452 Experimental Biochemistry. Preq: BCH 351 or coreq. BCH 551; quantitative chemical analysis recommended. 3(1-6) F. Fundamental techniques of biochemistry and molecular biology involving experimental study of carbohydrates, proteins, enzymes, nucleic acids, lipids, metabolism, and metabolic controls. Designed to accompany BCH 551. Theil

BCH 490 Special Studies in Biochemistry. Preq: Senior standing. 1-3 F,S.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

BCH 551 General Biochemistry. Preq: Three years of CH including CH 223 or equivalent; CH 331 or 431 strongly recommended. 3(3-0) F. Principles of biochemistry including structural and metabolic relationships of carbohydrates, lipids, proteins, nucleic acids, enzymes, and metabolic regulation. Jones

BCH (PHY) 553 Physiological Biochemistry. Preq: BCH 551. 3(3-0) S. Application of biochemical methods to the elucidation of the function of whole organisms. A. Bichemistry of 1) blood, 2) water, electrolyte, acid-base balance, 3) renal function, 4) muscle metabolism, 5) central nervous system, 6) autonomic nervous system, and 7) endocrine system. B. Biochemistry of adaptation to environment 1) high and low P_{O_2}, 2) hot and cold, 3) wet and dry, and 4) pollution. Longmuir

BCH 554 Radioisotope Techniques in Biology. Preq: BCH 351 or CI. 2(1-3) F. The different modes of radioactivity are correlated with methods of measurement. Emphasis on use and limitations of various instruments and techniques and on their application to research programs. Sisler

BCH 557 Introductory Enzyme Kinetics. Preqs: BCH 551 and MA 201 or MA 212. 3(3-0) S. Basic principles of chemical kinetics are applied to the development of enzyme kinetics. Limitations of the Michaelis equation are considered in light of the general rate equation. Inhibition and activation, pH functions, effects of temperature, elucidation of mechanisms, and transient state and relaxation kinetics are also considered. Main

BCH (GN, MB) 561 Biochemical and Microbial Genetics. Preqs: BCH 351 or 551, GN 411 or 505, MB 401 or equivalent. 3(3-0) S. The development of biochemical and microbial genetics, emphasizing both techniques and concepts currently used in research. Lectures and discussions of current research publications. Armstrong

BCH 590 Special Topics in Biochemistry. Preq: BCH 351 or equivalent. Credits Arranged, Maximum 3. F,S,Sum. Topics of special interest studied by small groups of students under faculty supervision, usually for the purpose of developing new courses. Graduate Staff

FOR GRADUATES ONLY

BCH 651 Physical Biochemistry. 3(3-0) S.

BCH 652 Biochemical Research Techniques. 1-3 S.

BCH (ANS) 653 Mineral Metabolism. 3(3-0) F.

BCH 655 Intermediary Metabolism I. 3(3-0) S.

BCH 657 Intermediary Metabolism II. 3(3-0) F.

BCH (CH) 659 Natural Products. 3(3-0) F.

BCH 691 Seminar in Biochemistry. 1 F,S.

BCH 695 Special Topics in Biochemistry. Credits Arranged

BCH 699 Biochemical Research. Credits Arranged.

Biological and Agricultural Engineering

FOR UNDERGRADUATES

BAE 211 Farm Machinery. 4(2-4) F,S. Machinery capabilities and limitations as related to design, cost, materials of fabrication, reliability, and tools and techniques involved in repair and maintenance. The operation, service and adjustment is studied by an analysis of the requirements to do the job for which the machine was designed and consideration of operating conditions. Recent machine developments and production practices, including selection, management, and economics of owning and operating machinery. Howell

BAE 215 Elements of Biological and Agricultural Engineering. Preq: Enrollment in SBE curriculum. 3(2-3) F. Pertinent topics basic to agricultural engineering and current progress relating to the different subject areas. Introduction to various engineering procedures, tool processes, and materials utilized by the agricultural industries. Blum

FOR ADVANCED UNDERGRADUATES

BAE 303 Energy Conversion in Biological Systems. Preqs: BS 100, MA 112 or 201, PY 205 or 211. 2(2-0) S. Energy transformations and exchanges of plants and animals are studied on the basis of physical theories and principles. Discussion of examples in convection, conduction, radiation, phase change, muscle work, photosynthesis, respiration and concentration of solutions. Suggs

BAE (SSC) 321 Irrigation, Terracing and Erosion Control. Preq: Jr. standing. 3(2-3) F. Principles of soil and water conservation engineering. Topics include surface and subsurface drainage, farm pond construction, open channel flow, soil erosion, conservation practices, irrigation, land forming and the basic principles of surveying. Emphasis on the practical application of basic soil and water engineering concepts. Sneed

BAE (FS) 331 Food Engineering. Preqs: PY 211 or 221. 3(2-3) F. Engineering concepts and their application to the food industry especially principles of thermodynamics, fluid flow, heat transfer, refrigeration and electricity. Jones, Willits

BAE 332 Farm Structures. Preq: PY 211 or 221. 3(2-3) S. Environmental relationships, design methods, materials, construction procedures and layout practices as they relate to current changes in agricultural production techniques. Problem situations relating to farm structures are investigated individually by each student in the laboratory. Emphasis on relating the theory to current applications. Blum

BAE 341 Farm Electrification and Utilities. Coreq: PY 212 or 221. 3(2-3) S. Electricity and its safe use as an energy source for agricultural applications. Fundamental farm wiring, circuit design, and control and protection devices including electric motors, water systems and the design of lighting, heating and ventilation systems for the farm and home. Glover

BAE 342 Agricultural Processing. Preqs: MA 301, MAE 301. 4(3-2) S. Theory and application of heat and mass transfer to processing of agricultural crops. Topics include psychrometrics, thin layer and deep bed drying, continuous-flow drying, and principles of biochemical processing. Problem sessions will demonstrate principles of fluid flow, materials handling, process control, and various drying systems. Young, Johnson

BAE 361 Analytical Methods. Preq: MA 301; Coreq: ESM 307. 3(2-2) F. Develops skills in mechanical design and problem solving. Mechanical design includes graphical and analytical determinations of velocity and acceleration, analysis and synthesis of linkages, design and/or selecting of beams, shafts, columns, bearings, clutches, brakes, gears, belts, and chains. Approximately one-fourth of the course develops skills related to converting ill defined problem situations into tractable engineering problems. Bowen

BAE 381 Agricultural Structures and Environment. Preqs: ESM 307, MAE 301. 3(2-3) S. Principles of environmental control and structural analysis are combined with biological principles for the design of agricultural structures. Topics include physiological reactions of animals, plants and agricultural produce to their environment, applications of heat transfer and psychometrics in calculating ventilation requirements and heating or cooling loads, structural analysis, material selection, agricultural waste management, and economic considerations of various structural alternatives. Baughman

BAE 391 Electrotechnology in Biological and Agricultural Engineering. Preq: EE 331. 3(2-3) F. Basic concepts for selecting and utilizing electromagnetic devices. Switching circuits and central circuits are discussed and transducers and measurement techniques are related to agricultural problems. McClure

BAE 411 Farm Power and Machinery. Preqs: BAE 211, PY 211 or 221. 3(2-3) S. The application of heat engineering principles in the development and utilization of power of internal combustion engines, both spark ignition and diesel. Thermodynamic principles and their application to the actual design and construction of engines. Principles of carburetion and ignition. Power transmission units, hydraulics and hydraulic controls. Power measurement and testing, and the economic utilization of power units. Fore

BAE (FS) 432 Food Engineering II. 3(2-3) S. (See food science, page 269.)

BAE 433 Crop Preservation and Processing. Preq: BAE 331. 3(2-3) S. Engineering concepts utilized in the processing or preservation of agricultural commodities, including 1) air flow measurement, 2) fan performance, 3) size reduction methods, 4) cleaning, sorting, and grading procedures, 5) materials handling, 6) air-vapor characteristics, and 7) crop drying or curing. Physical and biochemical characteristics of harvested crops, which define their requirements for quality preservation. Young

BAE 451, 452 Agricultural Engineering Design I and II. Preq: Sr. standing in SBE curriculum. 3(1-6) F,S. Design concepts are applied to current agricultural engineering problems. One major design project is combined with a variety of case studies and short term design problems. Rohrbach

BAE 461 Operations Engineering in Agriculture. Preqs: MA 112 or MA 102, EC 201 or equivalent. 3(3-0) S. Survey of systems analysis and operations research with emphasis on application to agricultural problems. Topics include: the systems approach to problem solving, economics of decision making, linear programming, dynamic programming, network analysis, probability and simulation. Sowell

BAE 462 Functional Design of Field Machines. Preqs: BAE 361 or equivalent, SSC 200. 3(2-2) S. The design and operation of the modern farm tractor and field machines that make effective use of energy and labor in farm commodities production. Topics include (a) engine cycles and efficiencies, Nebraska test procedures, power trains, traction efficiencies, rolling resistances, and hitching of tractors and (b) principles and devices used to accomplish functional objectives in tillage, planting, pesticide application, and harvesting equipment. Bowen

BAE (CHE) 465 Introduction to Biomedical Engineering. 3(3-0) F. (See chemical engineering, page 214.)

BAE (SSC) 471 Agricultural Water Management. Preqs: BS 100, SSC 200. 4(3-2) F. Aspects of hydrology and soil-water-plant relationships as related to agricultural water management. Drainage and irrigation emphasized. Water quality, agricultural related pollution, and water laws discussed. Skaggs

FOR GRADUATES AND ADVANCED UNDERGRADUATES

BAE 552 Instrumentation for Agricultural Research and Processing. Preqs: EE 331, MA 301. 2(1-3) Alt. F. Theory and application of primary sensing elements and transducers. Generalized performance characteristics and the use of standards. Use of specialized measurement systems for agricultural research and processing including an introduction to correlation and power spectral density measurements. Rohrbach

BAE (CE,MB) 570 Sanitary Microbiology. Preq: MB 401 or equivalent. 3(2-3) S. Aspects of microbiology and biochemistry as related to problems of stream pollution, refuse disposal and biological treatment. Laboratory exercises present basic microbiological techniques and illustrate from a chemical viewpoint some of the basic microbial aspects of waste disposal. Graduate Staff

BAE (CE) 578 Agricultural Waste Management. Preq: Grad. or advanced undergrad. standing. 3(2-3) F. Special laboratory techniques required for the characterization of agricultural and associated processing wastes. Principles and examples to develop waste management and nondestructive waste utilization systems that are integral to the total operation. Humenik

BAE (FS) 585 Biorheology. Preqs.: PY 205, ESM 307. 3(2-2) S. The concepts of strain, stress and the mechanical visco-elastic properties of biological solids, fluids and slurries. The time-dependent deformation and flow of biomaterials elements of strength of materials, rheological equations and model concepts, creep-relaxation and dynamic behavior, contact problems and the Boltzman superposition principle as a function of time, temperature and moisture content. Hamann

BAE 590 Special Problems. Preq: Sr. or grad. standing in agricultural engineering. Credits Arranged. Each student selects a subject for research and writes a technical report on results. Subject may pertain to any area of study in BAE. Graduate Staff

FOR GRADUATES ONLY

BAE 654 Nonequilibrium Thermodynamics in Bioengineering. 3(3-0) Alt. S.

BAE 661 Analysis of Function and Design of Biological and Physical Systems. 3(2-3) Alt. F.

BAE (SSC) 671 Theory of Drainage—Saturated Flow. 3(3-0) Alt. F.

BAE (SSC) 674 Theory of Drainage—Unsaturated Flow. 3(3-0) Alt. S.

BAE 690 Special Topics. Credits Arranged. 1-4 F,S.

BAE 695 Seminar. 1(1-0) F,S.

BAE 699 Research in Biological and Agricultural Engineering. Credits Arranged. F,S.

Biological Sciences

BS 100 General Biology. 4(3-3) F,S. Basic principles and concepts including the structure and function of cells and organisms, the organization and requirements of living systems, development, heredity and evolution.

BS 105 Biology in the Modern World. 4(3-3) F,S. For students who are not science majors. Treats the broad themes or principles of biology, such as metabolism, homeostasis, and interrelationships of organisms, at all levels of biological organization (i.e., molecular to biome). Emphasis on the organismic level with man as the representative organism; his physiology, behavior, genetics, and ecology are treated in depth.

BS (ENT) 410 Biology of Insects. 3(2-2) F. (See entomology, page 267.)

BS 495 Special Topics in Biology. 1-6 F,S. Independent research projects supervised by faculty member. Projects selected with faculty assistance and with approval of the coordinator of the Biological Sciences interdepartmental program.

FOR GRADUATES ONLY

BS 590 Special Problems in Biological Instrumentation. Preq: CI. 1-3 F,S.

BS 690 Seminar in Cell Biology. 1(1-0) S.

BS 696 Topics in Biological Ultrastructure. 1(1-0) F.

Biomathematics

FOR GRADUATES AND ADVANCED UNDERGRADUATES

BMA 451 Introduction to Mathematical Modeling of Biological Systems. Preqs: MA 112; two biology courses. Credit not allowed for BMA, MA or ST majors. 3(3-0) S. Intended primarily for students in biological sciences to develop an understanding of how biological concepts may be formulated in mathematical terms and how these formulations may be used in biological research. Topics include use of diagrams and flow charts in mathematical modeling, set relations, measurement error, proper use of dimension, probability models, rate equations, control of feedback. Illustrative examples from a variety of biological fields. Gold

BMA 493 Special Topics in Biomathematics. Preq: C.I. 1-3 F,S. Directed readings, problem sets, written and oral reports at an introductory level to meet student need and interest; 400-level courses during the developmental phase. Staff

BMA 501 Theoretical Biochemistry I. Preqs: MA 405, CH 433, BCH 551 or C.I. 3(3-0) F. Application of physical theory and mathematics to biochemistry. Examination of basic principles of molecular theory, reaction rate theory, statistical mechanics and nonequilibrium thermodynamics as applied to biochemical systems. (Offered F 1975 and alt. years.) Gold

BMA 502 Theoretical Biochemistry II. Preq: BMA 501. 3(3-0) S. Coupling of diffusion and chemical reactions. Mathematical description of enzyme control, coupled sequences of enzyme reactions, feedback loops and oscillatory reactions. Experimentally oriented topics include theory of chemical relaxation and tracer dynamics. (Offered S 1976 and alt. years.) Gold

BMA (MA, ST) 571 Biomathematics I. Preq: Advanced calculus, reasonable background in biology or C.I. 3(3-0) F. The role of theory construction and model building in the development of experimental science. Induction vs. deduction. The historical development of mathematical theories and models for the growth of one-species populations (logistic and offshoots), including consideration of age distributions (matrix theory, Leslie and Lopez; continuous theory, Lotka). Elementary theories on growth of organisms (von Bertalanffy, with applications to ecology; allometric theories, cultures grown in a chemostat). Mathematical theories of two and more species systems (predator-prey, competition, symbiosis; according to the Volterra-Lotka schemes, including present-day research), and related models for chemical reaction kinetics. Emphasis on scrutiny of the biological concepts and of the mathematical structure of the models in order to uncover weak and strong points. Mathematical treatment of differential equations in these models stresses qualitative and geometric aspects. van der Vaart

BMA (MA, ST) 572 Biomathematics II. Preqs: BMA 571, elementary probability theory. 3(3-0) S. Advanced mathematical techniques concerning nonlinear differential equations of the types encountered in BMA 571: several concepts of stability, asymptotic directions, periodic models. Comparison of deterministic and stochastic models for several biological problems including birth and death processes. Certain aspects of linear system theory (time-invariant and variable models) used for the analysis of biological systems. Applications of mathematics to biology, some recent research. van der Vaart

BMA 591 Special Topics. Preq: C.I. Maximum 3, 1-3 F,S. Directed readings, problem sets, written and oral reports to meet student need and interest; 500-level courses during the developmental phase. Graduate Staff

FOR GRADUATES ONLY

BMA 691 Advanced Special Topics. 1-3 F,S.

BMA 694 Seminar. 1(1-0) F,S.

BMA 699 Research. Credits Arranged F,S.

Botany

FOR UNDERGRADUATES

BO 200 Plant Life. 4(3-3) F,S. A survey of the types of plants and their diversities in structure, life cycle, habitat, and economic importance. Witherspoon, Van Dyke

BO (ZO) 360 Introduction to Ecology. Preq: A 200-level biology course. 4(3-3) F,S. The relationships between organisms and their environment, and of the interactions among organisms. An overview of basic ecology principles and their importance to man and his environment. Staff

BO 400 Plant Diversity. Preq: BO 200. 4(3-3) F. A comprehensive survey of the evolutionary diversity and phylogeny of the plant kingdom. Emphasis on the evolutionary trends and the basis for assumed relationships, considering fossils as well as living forms. Hardin

BO (CS) 402 Economic Botany. Preq: BO 200. 3(2-3) S. Emphasis is on plants and human affairs. Discussions center on all phases of the interrelationships of the plant world and the life history of incipient to modern human cultures. Treatment includes plants and plant products, beneficial and harmful, that man has used as necessities of life, as ameliorants contributing to his well-being, and as raw materials for industry. Ornamentals are excluded. Timothy

BO 403 Systematic Botany. Preq: BS 100 or BO 200. 4(2-4) S. A systematic survey of vascular plants, emphasizing field identification, terminology, and general evolutionary relationships. Stucky

BO (ZO) 414 Cell Biology. 3(3-0) F. (See zoology, page 388.)

BO 421 Plant Physiology. Preqs: BS 100 or BO 200, one year of college chemistry. 4(3-3) F,S. Physiology of the green plant emphasizing plant organization, water and solute relationships, organic and inorganic nutrition, growth and development. Noggle, Troyer

BO 480 Air Pollution Biology. Preqs: An introductory biological course and chemistry, jr. standing. 3(2-3) S. The effects of air pollutants on biological systems at the subcellular, cellular, tissue, organ, individual and community level. Anderson

BO 499 Independent Study in Botany. Preqs: At least eight hours of botany, advanced standing, and presentation of plan of work approved by a faculty member. 1-3 F,S. Discussions, library research, field, or laboratory investigations of topics under faculty direction on a tutorial basis. May be repeated for a maximum of six credits. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

BO 501 Plant Anatomy. Preq: BO 200. 4(2-6) F. The cells, tissues and organs of common flowering plants and gymnosperms. Growth and differentiation patterns with emphasis on current research. Anderson

BO 522 Advanced Morphology and Phylogeny of Seed Plants. Preq: BO 403. 4(3-3) S. Survey of morphology and evolution of angiosperms and gymnosperms. Emphasis to detailed vegetative and reproductive morphology of fossil and living forms, and to their presumed evolutionary relationships. (Offered S 1975 and alt. years.) Hardin

BO 524 Grasses, Sedges, and Rushes. Preq: BO 403. 4(2-6) F. Course deals with three large, economically and ecologically important plant families. An introduction to terminology, extensive field work emphasizing keying out plants collected, and a study of recently developed classification of the grasses. (Offered F 1975 and alt. years.) Staff

BO 544 Plant Geography. Preqs: BO 360, BO 403, GN 411, or equivalents. 3(3-0) S. Descriptive and interpretive plant geography, synthesizing data from ecology, genetics, geography, paleobotany and taxonomy. Includes a survey of the present distribution of major vegetation types throughout the world. A discussion of the history and development of this present pattern of vegetation, and of the principles and theories of plant geography. (Offered S 1975 and alt. years.) Staff

BO 551 Advanced Plant Physiology I. Preq: General botany or biology, and biochemistry. 3(3-0) F. The first half of a two-semester sequence covering the current status of plant physiology. Topics include plant organization, metabolism, respiration, and water and solute relations. Troyer

BO 552 Advanced Plant Physiology II. Preqs: General botany or biology, and biochemistry. 3(3-0) S. The second half of a two-semester sequence. Topics include photobiology, photosynthesis, inorganic nutrition, plant growth substances, physiology of seeds, vegetative growth, reproductive growth, aging and senescence. Noggle

BO 553 Laboratory in Advanced Plant Physiology I. Preq or coreq: BO 551. 1(0-3) F. Accompanies BO 551. Laboratory procedures in plant nutrition, plant structure and composition, water relations, respiration. Staff

BO 554 Laboratory in Advanced Plant Physiology II. Preq or coreq: BO 552. 1(0-3) S. Accompanies BO 552. Laboratory procedures in enzymes, photosynthesis, photobiology, plant growth substances. Staff

BO (ZO) 560 Principles of Ecology. Preq: Three semesters of college-level biology courses. 4(3-3) F. Provides a factual and philosophical framework for the understanding of ecology. Staff

BO 561 Physiological Ecology. Preqs: BO 421, BO (ZO) 560, or equivalents. 4(3-3) S. Approaches the plant community from a physiological standpoint. Emphasis on the individual in the community and how it responds to its immediate environment on a short- and long-term basis (Offered S 1975 and alt. years.) Blum

BO (MB) 574 Phycology. Preq: BS 100 or BO 200. 3(1-4) S. An introduction to the classes of algae. The systematic position, life history and ecology of important genera in the local flora, both fresh-water and marine. Witherspoon

BO (MB, PP) 575 The Fungi. Preq: BO 200 or equivalent. 3(3-0) F. An overview of the fungi within the framework of a survey of the major classes. Topics include

ultrastructure, environmental adaptations, sexuality, ontogeny, and economic importance. Van Dyke

BO (MB, PP) 576 The Fungi-Laboratory. Coreq: BO 575. 1(0-3) F. Provides illustrative material of the fungal assemblages discussed in BO 575. Van Dyke

BO 590 Topical Problems. Preq: CI. 1-3 F,S. Discussions and readings on problems in ecology, anatomy and morphology, taxonomy, and plant physiology. May be repeated, with change in topic, for a maximum of six credits. Graduate Staff

FOR GRADUATES ONLY

BO 612 Plant Morphogenesis. 4(3-3) S.

BO 620 Advanced Taxonomy. 3(2-2) S.

BO (PP) 625 Advanced Mycology. 4(2-6) F.

BO 631 Water Relations of Plants. 3(3-0) S.

BO 633 Plant Growth and Development. 3(3-0) S.

BO 634 Introduction to the Thermodynamics of Biological Systems. 3(3-0) S.

BO 636 Discussions in Plant Physiology. 1(1-0) F,S.

BO (ZO) 660 Advanced Topics in Ecology I. 4(3-3) S.

BO (ZO) 661 Advanced Topics in Ecology II. 4(3-3) S.

BO 691 Botany Seminar. 1(1-0) F,S.

BO 693 Special Problems in Botany. Credits Arranged F, S.

BO 699 Research. Credits Arranged F,S.

Chemical Engineering

FOR UNDERGRADUATES

CHE 205 Chemical Process Principles. Preqs: CH 107, MA 201. 3(3-0) F,S. Chemical interactions of matter and physical interactions of multiphase system. Introduces engineering methods of treating material balances, stoichiometry, thermophysics, thermochemistry and first law thermodynamics. Hopfenberg

CHE 225 Chemical Process Systems. Preq: PY 208, Coreq: MA 301. 3(2-2) S. Physical measurements: temperature, pressure pH, concentration, etc. including dynamic response of measuring elements. Control element, electronic, pneumatic, etc. Introduction to process control. Martin

CHE (UNI) 300 Chemical Technology and the Environment. 3(3-0) F. Provides a basis for informed judgment regarding appropriate political, economic, and technical means to prevent and control pollution. Chemical technology as a source of pollution and as a means for pollution control. Open to all students. Hopfenberg

CHE 301, 302 Elements of Chemical Engineering. Preqs: (301) MA 212; (302) CHE 301. 3(3-0) F,S. Principles including calculations involved in industrial processes and equipment. For students not majoring in CHE. Seely

CHE 311 Transport Processes I. Preqs: MA 301, PY 208, CHE 205. 3(2-2) F,S. Momentum and heat transfer with emphasis on applications in chemical processing. Problems in the design of fluid flow systems and heat exchangers. Rousseau

CHE 315 Chemical Process Thermodynamics. Preqs: CH 431, CHE 205, MA 301. 3(3-0) S. The laws of thermodynamics and their application to chemical engineering problems, both in theory and in practice. Criteria of equilibrium in physical and chemical changes. Behavior of real fluids, including mixtures. Beatty

CHE 316 Thermodynamics of Chemical and Phase Equilibria. Preq: CHE 315. 3(3-0) S. Thermodynamics is the principal tool for systematic study of chemical reaction equilibria and phase equilibrium. Fugacity, activity, and chemical potential as methods, for predicting the effect of temperature, pressure, etc. on equilibrium compositions. Methods for measuring and estimating thermodynamics properties important to equilibrium calculation in real systems. Beatty

CHE 325 Introduction to Plastics. Preq: CH 103. 3(3-0) F,S. Survey of plastics and polymers: types, applications, fabrication, processing and testing. Seely

CHE 327 Separation Processes I. Preq: CHE 311. 3(3-0) S. Applying principles of transport phenomena to the unit operations of absorption, extraction, distillation, drying, filtration, etc. with emphasis on design procedures and economic consideration. Rousseau

CHE 412 Transport Processes II. Preq: CHE 327. 3(3-0) S. Momentum, heat and mass transport processes, with emphasis on CHE. Problems in fluid, heat and mass transfer. Ferrell

CHE 425 Process Measurement and Control I. Preq: CHE 225, 327. 3(2-2) F. The continuous control of typical chemical engineering processes including the techniques of feedback, cascade, feedforward and interacting systems. Dynamics, stability, and control of heat exchangers, flow systems, distillation columns and chemical reactors. Martin

CHE 426 Process Measurement and Control II. Preq: CHE 425 or EE 435 or MAE 435. 3(2-2) S. An extension of the theory and application of process control techniques to the analysis of physical systems. Sampled data and nonlinear systems and an introduction to optimum control techniques and adaptive control. Martin

CHE 428 Separation Processes II. Preq: CHE 327. 3(3-0) S. The principles (diffusion and interphase mass transfer) underlying such unit operations as distillation, drying, absorption, etc. with emphasis on procedures and economic problems. Staff

CHE 431 Chemical Engineering Laboratory I. Preq: CHE 311. 3(1-5) S. Laboratory work on typical apparatus involving unit operations. Experiments augment the theory and data of lecture courses and develop proficiency in writing technical reports. Seely

CHE 432 Chemical Engineering Laboratory II. Preq: CHE 431. 3(1-5) F. A continuation of CHE 431. A small number of group projects in research, design or development. Seely

CHE 446 Chemical Process Kinetics. Preq: CHE 315. 3(3-0) F. The characterization and measurement of the rates of homogeneous and heterogeneous reactions. The design and analysis of chemical reactors. Felder

CHE 451 Chemical Engineering Design. Preq: CHE 315, 327, 432. 3(2-2) F,S. Chemical process design and optimization. The interplay of economic and tech-

nical factors in process development, site selection, project design, construction and production management. Applications of cost accounting, cost estimation for new equipment, measures of profitability. Marsland

CHE (BAE) 465 Introduction to Biomedical Engineering. Preqs: MA 202 or 212, PY 212 or 221. 3(3-0) F. Engineering applications to biomedical problems such as flow in the cardiovascular and respiratory systems; transfer of thermal energy in and from warm-blooded animals; transport of materials through physiological tissues and membranes, and performance of organ replacement and assist devices such as the artificial kidney and the intra-aortic balloon. Beatty

CHE 495 Seminar in Chemical Engineering. Preq: one semester required of CHE srs. 1(1-0) F,S. Professional aspects and topics of current interest. Staff

CHE 497 Chemical Engineering Projects. Preq: Elective for CHE srs. 1-3 F,S. Introduction to research through experimental, theoretical and literature studies of CHE problems. Oral and written presentation of reports. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

CHE 511 Problem Analysis for Chemical Engineers. Preqs: CHE 428, MA 301. 3(3-0) S. Applying methods of mathematical analysis to the formulation and solution of problems in transport phenomena, transient phenomena in unit operations, process dynamics and thermodynamics. Analog computer solutions of these problems. Ferrell

CHE 513 Thermodynamics I. Preq: CHE 315. 3(3-0) F. An intermediate course in thermodynamic principles and their applications to chemical and phase equilibria. The course is largely from a macroscopic viewpoint but consideration given to the statistical viewpoint. Beatty

CHE 515 Transport Phenomena. Preq: CHE 327. 3(3-0) S. A theoretical study of transport of momentum, energy and matter with emphasis on the latter two. The diffusional operations, including coupled heat and mass transfer, are introduced in the light of the theory. Marsland

CHE 517 Kinetics and Catalysis. Preq: CHE 446. 3(3-0) F. Homogeneous and heterogeneous kinetic reactions. Emphasis on fundamental approaches, experimental methods and mathematical techniques in engineering analysis of chemical reaction systems. Stahel

CHE 521 Mass Transfer Operations. Preq: CHE 327 or equivalent. 3(3-0) S. Multicomponent operations will be discussed in light of recent developments and innovations in both the operations themselves and in calculational techniques used in analyzing the operations. The equilibrium stage concept will be developed. If there is time, the continuous rate processes will be discussed. Problems unique to given operations, such as are encountered in extractive and azeotropic distillation. Rousseau

CHE 523 Fluid Dynamics and Heat Transfer. Preq: CHE 311. 3(3-0) F. Convective heat transfers in chemical process equipment, such as heat exchangers, chemical reactors, distillation and extraction reboilers, etc., and fluid dynamics and heat transfer of multiphase, multicomponent and chemically reactive systems. Ferrell

CHE 525 Process Dynamics. Preq: CHE 425. 3(3-0) F. The dynamic response of typical chemical process equipment including instrumentation and process control devices. Fundamental concepts of automatic control of process variables such as temperature, pressure, flow and liquid level. Martin

CHE (OR) 527 Optimization of Engineering Processes. Preqs: MA 511, CSC 111 or equivalent. 3(3-0) F. Mathematical methods for the optimization of engineering processes are developed, and illustrative applications are presented and discussed. Topics include mathematical programming, geometric programming, sensitivity analysis, direct search and elimination techniques, variational techniques and the minimum principle, quasilinearization and dynamic programming. Felder

CHE 535 Engineering Economy in Air Pollution Control Systems. Preqs: MAE 409, CE 576, or equivalent first course. 3(3-2) S. Principles and practice in designing equipment for the abatement of air pollution; estimation of capital cost and operating expense; economic optimization under various kinds of tax laws. Marsland

CHE 540 Electrochemical Engineering. Preq: Physical chemistry. 3(3-0) S. The application of electrochemical principles to such topics as electrolysis, electroanalysis, electroplating, metal refining, etc. Schoenborn

CHE 541 Cellulose Industries. Preq: Organic chemistry. 3(3-0) F. Methods of manufacture and application of cellulose chemical conversion products. Emphasis is on recent developments of synthetic fibers, films, lacquers and other cellulose compounds. Seely

CHE 543 Technology of Plastics. Preq: Organic chemistry. 3(3-0) S. The properties, methods of manufacture and applications of synthetic resins. Recent developments in the field. Schoenborn

CHE 561 Biomedical Engineering I: Fluid Flow and Heat Transfer. Preq: CHE (BAE) 465, or equivalent background. 3(3-0) S. The extension of fluid flow and heat transfer concepts to biomedical engineering is presented along with the grounding in physiology requisite to proper modeling of mammalian flow and thermal processes. Beatty

CHE (TC) 569 Polymers, Surfactants and Colloidal Materials. Preqs: CHE 315, CH 431, 223. 3(3-0) F. The relationship between molecular structure and bulk properties of nonmetallic materials as applied in CHE processes. Attention to the application of surface and colloid chemistry as well as polymer science. Hopfenberg

CHE 597 Chemical Engineering Projects. Preq: Grad. standing. 1-3 F,S. A laboratory study of some phase of CHE or allied field. Staff

CHE 598 Special Topics in Chemical Engineering. Preq: Grad. standing. 1-3 F,S. The course may consist of directed reading of literature, introduction to research methodology, special topics of current interest, seminar discussions dealing with special topics, etc. Graduate Staff

FOR GRADUATES ONLY

CHE 611 Chemical Process Design and Simulation. 3(3-0) S.

CHE 613 Thermodynamics II. 3(3-0) F.

CHE 617 Chemical Reaction Engineering. 3(3-0) S.

CHE 621 Advanced Mass Transfer. 3(3-0) F.

CHE 623 Advanced Fluid Dynamics. 3(3-0) S.

CHE 624 Advanced Heat Transfer. 3(3-0) F.

CHE (TC) 669 Diffusion in Polymers. 2(2-0) S.

CHE (TC) 671 Special Topics in Polymer Science. 1-3 F.

CHE 693 Advanced Topics in Chemical Engineering. 1-3 F,S.

CHE 695 Seminar. 1(1-0) F,S.

CHE 699 Research. Credits Arranged F,S.

Chemistry

FOR UNDERGRADUATES

CH 101 General Chemistry I. 4(3-3) F,S. Fundamental concepts, including atomic and molecular structure, states of aggregation of matter, chemical reactions and stiochiometry. Should be followed by CH 103, 105 or 107.

CH 103 General Chemistry II. Preq: CH 101, 4(3-3) F,S. Designed as a terminal course and for students in curricula which do not require full-year chemistry courses beyond the freshman level. Topics include acid-base reactions, homogeneous and heterogeneous equilibria, electrochemistry, and descriptive aspects of inorganic, organic, nuclear and biochemistry.

CH 104 Experimental Chemistry. Coreq: CH 105. 1(0-3) F,S. Laboratory supplement to CH 105. Required for CH 105 students who plan to take additional chemistry courses.

CH 105 Chemistry—Principles and Applications. Preq: CH 101. 3(3-0) F,S. A continuation of CH 101, intended primarily for engineering students. Emphasis on introductory chemical thermodynamics, equilibrium, electrochemistry, chemical kinetics, and the application of basic chemical principles to the treatment of organic and inorganic systems. CH 105 serves as prerequisite for additional chemistry courses only if supplemented by CH 104.

CH 106 Laboratory Techniques I. Coreq: CH 101 H. 1(0-3) F. For students majoring in chemistry to supplement CH 101 laboratory.

CH 107 Principles of Chemistry. Preq: CH 101 with a grade of C or better. 4(3-3) F,S. Continuation of CH 101, for students who plan to take full-year courses in advanced chemistry and for those desiring a more quantitative course than CH 103. Emphasizes detailed quantitative aspects of stoichiometry, kinetics, equilibrium and electrochemistry, and the treatment of chemical reactions in terms of acid-base concepts.

CH 108 Laboratory Techniques II. Coreq: CH 107 H. 1(0-3) S. For students majoring in chemistry to supplement CH 107 laboratory.

CH 111 Foundations of Chemistry. 4(3-2) F,S. General chemistry for liberal arts students. Topics include atomic and molecular structure, periodic classification, gas laws, chemical equilibrium, and elementary descriptive inorganic and organic chemistry.

CH 220 Introductory Organic Chemistry. Preq: CH 103 or 107, or CH 105 or 104. 4(3-3) F,S. Topics include alkanes and cycloalkanes, reactions of carbon-carbon multiple bonds, elimination and substitution reactions of alcohols and alkyl halides, aromatic compounds, carbonyl compounds, organic acids and derivatives, and organic bases.

CH 221, 223 Organic Chemistry I, II. Preq: (221) CH 107; (223) CH 221. 4(3-3) F,S. Two-term sequence covering the fundamentals of organic chemistry, including both aliphatic and aromatic compounds.

CH 315 Quantitative Analysis. Preq: CH 103 or 107, or CH 104 and 105. 4(3-3) F,S. Fundamental principles and modern techniques of chemical analyses. Topics include spectrochemical, electrochemical, and volumetric methods of analysis, modern chemical instrumentation, and interpretation of data.

CH 331 Introductory Physical Chemistry. Preqs: CH 103 or 107, or CH 104 and 105; MA 102 or 112. 4(3-3) F,S. For students whose mathematics background is not sufficient to meet CH 431, 433 requirements, but who desire instruction on chemical principles above freshman level.

CH 401 Systematic Inorganic Chemistry. Coreq: CH 433. 3(3-0) S. Survey of chemical elements based on atomic structure and the periodic system; also newer concepts of structure and symmetry.

CH 411 Analytical Chemistry I. Preq: CH 434. 4(2-6) F. Includes the design, execution, and interpretation of quantitative chemical measurements. Chromatographic, precipitation, and spectroscopic methods.

CH 413 Analytical Chemistry II. Preq: CH 411. 4(2-6) S. Methods of quantitative analysis based on solution chemistry, electrochemistry, and reaction kinetics.

CH 428 Qualitative Organic Analysis. Preq: CH 223. 3(1-6) F,S. The identification of organic compounds by means of physical, chemical and spectral properties.

CH 431 Physical Chemistry I. Preqs: CH 107, MA 202, PY 203 or 208. Coreq: MA 301. 3(3-0) F,S. CH 431, 433 and 435 provide an intensive study of physical chemical principles. CH 431 emphasizes states of matter, thermodynamics, and physical and chemical equilibrium.

CH 432 Physical Chemistry I Laboratory. Coreq: CH 431. 1(0-3) F. Laboratory course related to CH 431. Experience in measuring quantities associated with chemical thermodynamics and equilibria, treatment of laboratory data, and analysis of errors.

CH 433 Physical Chemistry II. Preqs: CH 431, MA 301. 3(3-0) F,S. A continuation of CH 431, emphasizing properties of solids and solutions, electrochemistry, reaction kinetics and kinetic theory.

CH 434 Physical Chemistry II Laboratory. Coreq: CH 433. 2(0-6) S. A project-oriented course to acquaint chemistry students with modern physical chemistry techniques.

CH 435 Physical Chemistry III. Preqs: CH 431, MA 301. 3(3-0) F. A continuation of CH 431, emphasizing molecular structure and chemical bonding.

CH (TC) 461 Chemistry of Fibers. 3(3-0) F. (See textile chemistry, page 375.)

CH 490 Chemical Preparations. Preq: Three years of CH. 3(1-6) F,S. Lectures and laboratory work in preparative chemistry. Synthetic procedures illustrate advanced methods and techniques in both inorganic and organic chemistry.

CH 491 Honors Chemistry. Preq: Admission to honors program or consent of department. 1-3 F,S. A special studies course for superior students pursuing chemistry studies in greater depth.

CH 493 Chemical Literature. Preq: Three years of CH. 1(1-0) F. A systematic introduction to the location and retrieval of information required for the solution of chemical problems.

CH 495 Special Topics in Chemistry. Preq: C.I. 1-3 F,S. To serve needs not covered by existing courses.

CH 499 Senior Research in Chemistry. Preq: Three years CH. Credits Arranged. 1-3 F,S. Independent investigation of a research problem under the supervision of chemistry faculty member.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

CH 501 Inorganic Chemistry I. Preq: CH 433. 3(3-0) F. Modern chemistry from the point of view of the chemical bond, molecular structure, and spectroscopy. Several topics chosen from group theory, molecular symmetry, molecular orbital and crystal field theories, electronegativity, solid state, magnetic properties, electronic absorption, ORD, CD, and MCD, Mössbauer, nmr, nqr, ESCA, photoelectron, and vibrational spectroscopies. Computer facilities are used.

CH 503 Inorganic Chemistry II. Preq: CH 501. 3(3-0) S. A continuation of CH 501. Knowledge of physical methods applied to chemistry of representative elements, transition metals (3d, 4d, 5d), lanthanides, and actinides. Topics include nonaqueous solvents, acids and bases, inorganic reaction mechanisms, solid state reactions, coordination chemistry including chelates and organometallic compounds, crystal field stabilization energy, Jahn-Teller and trans effects, stabilization of valence states, and some bio-inorganic chemistry.

CH 511 Chemical Spectroscopy. Preq: CH 433. 3(3-0) F. Theory, analytical applications and interpretation of spectra as applied to chemical problems. Emphasis upon ultraviolet, visible and infrared spectra. (Offered F 1974 and alt. years.)

CH 515 Chemical Instrumentation. Preq: CH 431; Coreq: CH 411. 3(3-0) S. Basic electronic components and circuits, the response of laboratory instruments, design and modification of typical electronic control and measurement systems. Emphasis on transducers and control elements utilized in chemical research. (Offered S 1976 and alt. years.)

CH 517 Physical Methods of Elemental Trace Analysis. Preq: CH 315 or 331 or C.I. 3(3-0) F. The principles and applications of currently used methods of trace analysis. Topics include pulse polarography, potentiometry, UV-Vis spectrophotometry, atomic absorption, emission spectrometry, fluorescence, neutron activation analysis, and spark source mass spectrometry.

CH 518 Trace Analysis Laboratory. Coreq: CH 517 or C.I. 2(0-6) F. Instrumental techniques including UV-Vis spectrophotometry, fluorescence, emission spectrometry, atomic absorption, pulse polarography, and neutron activation analysis.

CH 521 Advanced Organic Chemistry I. Preqs: CH 223, 433 or 435. 3(3-0) F. Structure, stereochemistry and reactions of the various classes of hydrocarbons. The molecular orbital treatment of bonding and reactivity of alkenes, the conformational interpretation of cycloalkane and cycloalkene reactivity, and the application of optical isomerism to reaction mechanisms.

CH 523 Advanced Organic Chemistry II. Preq: CH 521. 3(3-0) S. Acid-base theory and mechanistic organic chemistry as applied to synthetically useful organic reactions.

CH 525 Physical Methods in Organic Chemistry. Preqs: CH 223 and 433 or 435. 3(3-0) S. Physical methods applied to solution of structural problems in organic chemistry. Emphasis on spectral methods including infrared, ultraviolet, nuclear magnetic resonance, mass spectrometry, electron paramagnetic resonance, x-ray and electron diffraction, and optical rotatory dispersion.

CH 531 Chemical Thermodynamics. Preqs: CH 433, MA 301. 3(3-0) F. Extension of elementary principles to treatment of ideal and real gases, ideal solutions, electrolytic solutions, galvanic cells, surface systems and irreversible processes. Introduction to statistical thermodynamics and the estimation of thermodynamic functions from spectroscopic data.

CH 533 Chemical Kinetics. Preqs: CH 433, MA 301. 3(3-0) S. Emphasis on experimental and mathematical techniques, elements of the kinetic theory, and theory of the transition state. Applications to gas reactions, reactions in solution and mechanism studies. (Offered S 1975 and alt. years.)

CH 535 Surface Phenomena. Preqs: CH 433, MA 301. 3(3-0) S. Formulations of basic theories are presented with illustrations of their current applications. (Offered S 1976 and alt. years.)

CH 537 Quantum Chemistry. Preqs: MA 301, CH 435 or PY 407. 3(3-0) S. The elements of wave mechanics applied to stationary energy states and time dependent phenomena. Applications of quantum theory to chemistry, particularly chemical bonds.

CH 539 Colloid Chemistry. Preqs: CH 220, 315 or 331 or CI. 3(2-3) S. Theories, basic principles, and fundamental concepts including preparation and behavior of sols, gels, emulsions, foams, and aerosols and topics in areas of adsorption, Donnan equilibrium, dialysis, and small particle dynamics. Laboratory includes independent project studies in specialized areas. (Offered S 1975 and alt. years.)

CH 545 Radiochemistry. Preq: CH 431 or PY 410. 3(2-3) S. Applications of radioactivity to chemistry and applications of chemistry to radioactive elements, particularly transuranium elements and fission products. (Offered S 1976 and alt. years.)

CH (TC) 562 Physical Chemistry of High Polymers - Bulk Properties. 3(3-0) F. (See textile chemistry, page 375.)

FOR GRADUATES ONLY

CH 623 Valence and the Structure of Organic Molecules. 3(3-0) F.

CH 625 Organic Reaction Mechanisms. 3(3-0) S.

CH 627 Chemistry of Metal-Organic Compounds. 3(3-0) F.

CH 631 Chemical Thermodynamics II. 3(3-0) S.

CH (BCH) 659 Natural Products. 3(3-0) F.

CH 691 Seminar. 1(1-0) F,S.

CH 693 Advanced Topics in Physical Chemistry. 3(3-0) F,S.

CH 695 Special Topics in Chemistry. Maximum 3 F,S.

CH 699 Chemical Research. Credits Arranged F,S.

Civil Engineering

FOR UNDERGRADUATES

CE 201 Elements of Plane Surveying. Preq: Soph. standing. 3(2-3) F. Not for CE department majors. Theory and practice of plane surveying precision specifications, horizontal and vertical control, stadia surveys, area determinations, circular and compound curves, topographic mapping, solar and celestial observations, rural and urban land surveys.

CE 202 Introduction to Civil Engineering. Preq: MA 201. 2(1-3) F,S. Computer solution of typical problems in each subject area of civil engineering.

CE 301 Engineering Surveying. Preq: CE 202 3(2-3) F,S. Principles of surveying and applications in planning, design and construction; including horizontal and vertical control; topographic maps, photogrammetry and elements of geodesy.

CE 305 Transportation Engineering I. Preq: CE 301. 4(3-2) F,S. Integrated approach to planning, designing operation of transportation systems. Engineering and economic aspects of basic transport modes, (including highway, rail, water and air facilities) are studied.

CE 325 Structural Analysis. Preq: ESM 301. 3(2-3) F,S. Stress analysis of statically determinate beams and framed structures under fixed and moving loads; analysis of displacements by methods of conjugate beam and virtual work; indeterminate structural analysis of both rigid frames and trusses by virtual work and by stiffness method.

CE 326 Structural Engineering I. Preq: CE 325. 4(3-3) F,S. Fundamental principles of elastic, inelastic and ultimate strength analysis and proportioning of structural members in metal, concrete and timber.

CE 332 Materials of Construction. Preq: MAT 200. 3(2-3) F,S. Manufacture and properties of calcareous and bituminous cements and mineral aggregates. Mechanical properties of portland cement concrete, bituminous concrete, masonry materials and timber. Materials testing for research.

CE 342 Soil Engineering I. Preq: CE 332. 4(3-2) F,S. Soil identification, index properties, effective stress concepts, settlement analysis, evaluation of shear strength and bearing capacity, fundamentals of foundation selection and design.

CE 365 Construction Engineering I. Preq: Jr. standing. 4(3-3) F,S. Construction operations course emphasizing organization of construction industry; construction methods, equipment, productivity and safety; project planning, scheduling and control.

CE 370 Elements of Environmental Hygiene. Preq: Soph. standing. 3(2-3) S. Environmental factors affecting human health and their evaluation and control. Topics include: water supplies; sewage disposal; swimming pool and refuse sanitation; insect and rodent control; milk and food sanitation; the physical factors of noise, heat, illumination, and ionizing radiation; housing; industrial hygiene; and environmental hygiene programs.

CE 382 Hydraulics. Preq: ESM 200. 4(3-3) F,S. Properties of fluid, laws of conservation of mass, momentum and energy; applications to the mechanics of flow through pipes and channels; fluid measurements; theory of design and characteristics of hydraulic machines.

CE 383 Water Resources Engineering I. Preq: CE 382. 4(3-3) F,S. Application of natural science, physics and chemistry in the engineering or urban water and waste systems. Case studies illustrate applications and relationship of systems to management of environmental quality in urban areas.

CE 406 Transportation Engineering II. Preq: CE 305. 3(2-2) F,S. Urban transportation problems and design of modal interfaces such as airports, shopping centers, parking garages, port facilities and other multimodal terminals.

CE (ARC) 415 Architectural Structures I. Preq: ESM (ARC) 316. 3(2-3) F. Not open to CE students. Fundamental concepts underlying the behavior of statically determinate building systems; investigation of the design and construction techniques used in steel and timber framing.

CE (ARC) 416 Architectural Structures II. Preq: CE (ARC) 415. 3(2-3) S. Not open to CE students. Fundamental concepts underlying the behavior, analysis, and design of statically indeterminate building systems; investigation of design and construction techniques in framing, analysis procedures for indeterminate structural elements; application of design emphasizing reinforced concrete construction. Terminal design project allows a synthesis of the four semester structures sequence.

CE 425 Intermediate Structural Analysis. Preq: CE 325. 3(3-0) F,S. Rigorous treatment, at intermediate level, of indeterminate structural analysis. Energy principles, force and displacement methods, special topics.

CE 427 Structural Engineering II. Preq: CE 326. 3(2-3) F,S. Basic concepts of structural design. Analysis and design of complete structural systems.

CE 443 Soil Engineering II. Preq: CE 342 3(3-0) F,S. Lateral earth pressure theories and their application to analysis and design of slopes and retaining structures; ground water hydraulics; placement of fills; soil behavior in pavement systems, stablization techniques.

CE 450 Civil Engineering Design. Preq: One from: CE 406, 427, 443, or 484. 3(1-6) F,S. Integrated team approach to a major civil engineering project involving planning, design and analysis under realistic conditions including environmental factors.

CE 460 Construction Engineering Project. Preqs: CE 463, 466. 3(2-3) F,S. Planning, design, construction and management of a construction project.

CE 463 Cost Analysis and Control. Preq: CE 365. 3(2-3) F,S. Cost engineering, project estimating, bid procedures, construction cost analysis and control.

CE 464 Legal Aspects of Contracting. Preq: Sr. standing. 3(3-0) S. Legal aspects of construction contract documents and specifications; owner-engineer-contractor relationships and responsibilities; bids and contract performance; labor laws.

CE 466 Construction Engineering II. Preqs: CE 326, 365. 3(2-3) F,S. Introduction to building systems construction emphasizing planning, analysis, design and construction of structural subsystems.

CE 472 Elements of Air Quality Management. Preq: College level physics and sr. standing. 3(2-3) F. Pollution and community air quality management, including pollutant sources; effects on biological systems, materials, and the atmosphere; meteorological factors; air sampling; abatement and control techniques; air quality and emission standards; and legal, economic, and administrative aspects.

CE 484 Water Resources Engineering II. Preq: CE 383. 3(3-0) F,S. Occurrence, flow and control of natural and impounded waters. Case studies of storm drainage, flood control and stream sanitation illustrate the use of these principles in the management of river basin water resources.

CE 486 Sanitary Engineering Measurements of Water Quality. Preqs: Freshman chemistry and sr. standing in Engineering or Agriculture and Life Sciences. 3(2-3) S. Introduction to elementary measurement and interpretations of pollutants in water and wastewater. Examination of the nature and character of municipal refuse.

CE (OY, MAS) 487 Physical Oceanography. 3(3-0) S. (See physical oceanography, page 335.)

CE 498 Special Problems in Civil Engineering. Preq: Sr. standing in CE. 1-3 F,S. Directed reading in the literature of civil engineering, introduction to research methodology, seminar discussions, dealing with special civil engineering topics of current interest.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

CE 507 Airphoto Analysis I. Preq: Sr. standing 3(2-3) S. Principles and concepts for engineering evaluation of aerial photographs, including analysis of soils and surface drainage characteristics. Wahls

CE 508 Airphoto Analysis II. Preq: CE 507 3(2-3) S. Continuation of CE 507 with applications to highway and airport projects. Wahls

CE 509 Photogrammetry. Preq: CE 201 or CE 301. 3(2-3) F. Elements of aerial photogrammetry as applied to civil engineering, surveying and mapping, geometry of aerial photographs, flight planning for aerial photography and stereoscopic plotter instruments, especially the Kelsh Plotter.

CE 514 Municipal Engineering Projects. Preq: Sr. standing in CE. 3(2-3) S. Special problems relating to public works, public utilities, urban planning and city engineering. Babcock

CE 515 Transportation Operations. Preq: CE 305. 3(3-0) F. Analysis of traffic and transportation engineering operations. Heimbach

CE 516 Transportation Design. Preq: CE 305. 3(2-3) F. Geometric elements of traffic and transportation engineering design. Cribbins

CE 517 Water Transportation. Preq: CE 305. 3(3-0) F. Planning, design, construction and operation of waterways, ports, harbors and related facilities. Feasibility of piers, ports and multipurpose river basin projects. Design of marine structures and civil works including locks, dams, harbors, ports and contractive and protective works. Cribbins

CE 524 Analysis and Design of Masonry Structures. Coreq: CE 427. 3(3-0) F. Theory and design of masonry arches, culverts, dams, foundations and masonry walls subjected to lateral loads.

CE 525, 526 Matrix Structural Analysis I, II. Preq: (525): CE 425; (526): CE 326. 3(3-0) F,S. Matrix methods of structural analysis for digital computer solutions for general plane frames, trusses, and grids as well as general three dimensional trusses and frames. Inclusion of effects due to prestrain, temperature, elastic stability functions, joint deformations, and support settlements. Introduction to finite-element analysis of plane elasticity problems. Dean, Smith

CE 531 Structural Models. Preq: CE 427. 3(2-3) S. Dimensional analysis and structural similitude, indirect and direct models, model materials and experimental techniques, individual project in structural model analysis. Mirza, Zia

CE 534 Plastic Analysis and Design. Preq: CE 427. 3(3-0) S. Theory of plastic behavior of steel structures; concept of design for ultimate load and the use of load factors. Analysis and design of components of steel frames including bracing and connections. Ely

CE 536 Theory and Design of Prestressed Concrete. Preq: CE 427. 3(3-0) F. Principles and concepts of design in prestressed concrete including elastic and ultimate strength analyses for flexural, shear, bond and deflection. Principles of concordancy and linear transformation for indeterminate prestressed structures. Mirza, Zia

CE (MAS, OY) 541 Gravity Wave Theory I. 3(3-0) S. (See marine sciences, page 297.)

CE 543 Hydraulics of Ground Water. Preq: CE 382 or 342 or equivalent. 3(3-0) F. Principles of ground water hydraulics; theory of flow through idealized porous media; the flow net solution; seepage and well problems. Kashef

CE 544 Foundation Engineering. Preq: CE 342. 3(3-0) S. Subsoil investigations; excavations; design of sheeting and bracing systems; control of water; footing, grillage and pile foundations; caisson and cofferdam methods of construction. Kashef, Langfelder

CE 547 Fundamentals of Soil Mechanics. Preq: ESM 301. 3(3-0) S. Physical and mechanical properties of soils governing their use for engineering purposes; stress relations and applications to a variety of fundamental problems. Wahls

CE 548 Engineering Properties of Soils I. Preq: CE 342. 3(2-3) F. Study of soil properties significant in earthwork engineering, including soil solids, basic physio-chemical concepts, classification, identification, plasticity, permeability, capillarity, and stabilization. Laboratory work includes classification, permeability and compaction tests. Kashef, Langfelder

CE 549 Engineering Properties of Soils II. Preq: CE 548. 3(2-3) S. Continuation of CE 548. Compressibility, stress-strain relations and shear strength theories for soil. Laboratory work includes consolidation and shear strength tests. Langfelder

CE 551 Theory of Concrete Mixtures. Preq: CE 332. 3(3-0) F. Study in depth of portland cement concrete mixtures including types and properties of portland and special cements, mix design methods, fresh and hardened concretes, admixtures. Mullen

CE 553 Asphalt and Bituminous Materials. Preq: CE 332. 3(2-3) S. Study in depth of asphalts and tars properties for use in waterproofing and bituminous materials. Theories of design of bituminous mixtures for construction and paving uses including types and properties of asphalt cements, cutbacks, emulsions, blown asphalts and tars. Laboratory work required. Head, Mullen

CE 555 Highway and Airport Pavement Design. Preq: CE 406 or CE 443. 3(2-3) S. Theoretical analysis and design of highway and airport pavements with critical evaluation of current design practices. Head

CE (BAE, MB) 570 Sanitary Microbiology. Preq: MB 401 or equivalent. 3(2-3) S. Fundamental aspects of microbiology and biochemistry presented and related to problems of stream pollution, refuse disposal and biological treatment. Laboratory

exercises present basic microbiological techniques and illustrate basic microbial aspects of waste disposal.

CE 571 Theory of Water and Waste Treatment. Preq: Grad. standing. 3(3-0) F. Study of the basic physical and chemical processes underlying water and waste treatment, including mass transfer, equilibria, and kinetics. Galler

CE 572 Design of Water and Wastewater Facilities. Preq: CE 571. 3(3-0) S. Theory and design of water and wastewater treatment plants. Galler

CE 573 Unit Operations and Processes in Waste Treatment. Preq: CE 486; Coreq: CE 571. 3(1-6) F. Unit operations and processes in water and wastes engineering, including sedimentation, thickening, chemical coagulation, vacuum filtration, carbon adsorption, biological treatment, and special projects. Galler

CE (NE) 574 Environmental Consequences of Nuclear Power. Preq: C.I. 3(3-0) S. Examination of environmental consequences resulting from the siting, construction and operation of nuclear power plants and the environmental consequences of alternatives to nuclear power. Smallwood

CE 575 Civil Engineering Systems. Preq: MA 405. 3(3-0) S. Examination of civil engineering systems and their design optimization. Systems studied include water resources engineering, structural engineering, transportation engineering and construction. Galler

CE 576 Atmospheric Pollution. Preq: Grad. or advanced undergrad. standing. 3(3-0) S. Topics include: pollutant sources; effects on man and other animals, vegetation, materials and visibility; meteorological factors; air sampling, control devices; air quality and emission standards; and legal, economic and administrative aspects.

CE (BAE) 578 Agricultural Waste Management. 3(2-3) F. (See biological and agricultural engineering, page 209.)

CE 580 Flow in Open Channels. Preq: CE 382. 3(3-0) F. Theory and application of flow in open channels, including dimensional analysis, momentum-energy principle, gradually varied flow, high-velocity flow, energy dissipators, spillways, waves, channel transitions and model studies. Amein

CE (MAS) 581 Introduction to Oceanographic Engineering. Preq: CE 382. 3(3-0) S. Engineering aspects of physical oceanography. Propagation of waves theory, methods of wave forecasting and analysis of wave spectra. Application of physical oceanography to design of marine and coastal installations. Amein, Machemehl

CE 591, 592 Civil Engineering Seminar. 1(1-0) F,S. Discussions and reports.

CE 598 Civil Engineering Projects. 1-6 F,S. Special projects.

FOR GRADUATES ONLY

CE 601 Transportation Planning. 3(3-0) S.

CE 602 Advanced Transportation Design. 3(2-3) F.

CE 603 Airport Planning and Design. 3(2-3) F.

CE 604 Urban Transportation Planning. 3(3-0) S.

CE 605 Traffic Flow Theory. 3(3-0) S.

CE 624 Analysis and Design of Structural Shells and Folded Plates. 3(3-0) S.

CE 625 Advanced Structural Design I. 3(3-0) F.

CE 626 Advanced Structural Design II. 3(2-3) S.

CE 627 Analysis and Design of Structures for Dynamic Loads. 3(3-0) S.

CE 631 Field Analysis of Structural Systems. 3 (3-0) F.

CE 635 Advanced Theory of Concrete Structures. 3(3-0) S.

CE 641, 642 Advanced Soil Mechanics. 3(3-0) F,S.

CE 644 Ground Water Engineering. 3(3-0) S.

CE 646 Dynamics of Soils and Foundations. 3(3-0) S.

CE 651 Theory of Limit Analysis. 3(3-0) F.

CE 652 Inelastic Solids and Structures. 3(3-0) S.

CE 661 Numerical Methods in Structural Mechanics. 3(3-0) F.

CE 662 Probabilistic Methods of Structural Engineering. 3(3-0) F.

CE 671 Advanced Water Management Systems. 4(3-3) F.

CE 672 Advanced Water and Waste Treatment: Principles and Design. 4(3-3) S.

CE 673 Industrial Water Supply and Waste Disposal. 3(3-0) F.

CE 674 Stream Sanitation. 3(3-0) S.

CE 698 Special Topics in Civil Engineering. 1-3 F,S.

CE 699 Civil Engineering Research. Credits Arranged

Computer Science

CSC 101 Introduction to Programming. 3(2-2) F,S. Understanding algorithms, programs and computers. Organization and characteristics of computers. Fundamental algorithms associated with computing. Data representation. Basic programming and program structure. Debugging and verification of programs. Computer solution of numerical and non-numerical problems using one or more programming languages.

CSC 102 Programming Concepts. Preq: CSC 101. 3(3-0) F,S. The features available in higher-level programming languages. The student develops good programming habits by writing a variety of non-numerical application programs. Emphasis is on the global properties of programs in a block-structured language with list and string manipulation facilities.

CSC 111 Algorithmic Languages I. Coreq: MA 102. 2(2-1) F,S. Introduction to a problem-oriented computer language (currently FORTRAN IV) for use in problem solution using digital computers. Designed as a two-hour service course for scientifically oriented students, primarily in Engineering with programs slanted toward engineering applications.

CSC 112 Basic Computer Organization and Assembly Language. Preq: CSC 101 or 111. 3(3-0) F,S. Binary and hexadecimal number systems. Description of machine organization, including memory, addressing schemes, registers, and data channels. Internal representation of data and instructions. Machine language and the assembly process. Loading and execution. Program relocation. Input and output using facilities of a supervisor program. Interrupts and their priorities. Combining separately translated programs for execution.

CSC 200 Introduction to Computers and Their Uses. (A student who has taken CSC 101 or 111 may not receive credit.) 3(3-0) F,S. An introduction to electronic digital computers, including the parts of a computer, a step-by-step description of the processes which the computer goes through in performing its tasks, and description of several uses to which the computer is currently being put. Intended for non-technical students desiring knowledge of computer capabilities and limitations.

CSC 251 Principles of Programming - Fortran. Preqs: CSC 111 or 102. 1(1-0) F. The programming language Fortran and its applications to numerical computation and file manipulation. Emphasis on features and restrictions which are unique to Fortran. Programming assignments which explore the language in depth (Grading S-NC).

CSC 252 Principles of Programming - Cobol. Preq: CSC 101. 1(1-0) F. Introduction to the business-oriented programming language Cobol. Programming assignments cover general data processing, file maintenance and report generation. (Grading S-NC).

CSC 253 Principles of Programming - Algol. Preq: CSC 102. 1(1-0) F. Algol 60 presented as a theoretical construct and a practical programming language. Extensions to Algol 60. Programming problems in a variety of applications areas. (Grading S-NC).

CSC 254 Principles of Programming - APL. Preq: MA 231 or MA 405. 1(1-0) S. Advanced programming concepts in APL and their application to a wide variety of computing problems. The APL reference language and locally available APL hardware representations. (Grading S-NC).

CSC 255 Principles of Programming - Snobol. 1(1-0) F. The syntax and semantics of the symbol manipulation language Snobol 4. Applications of the language to programming problems in non-numeric areas. (Grading S-NC).

CSC 301 Principles of Systems Programs. Preq: CSC 112. 3(3-0) F,S. Advanced topics in assembly language programming. Program relocatability. Definition, call and expansion of macros. Historical survey of development of operating systems. Definition of operating system components. Use of operating system facilities.

CSC 302 Introduction to Numerical Methods. Preq: CSC 101 or 111. Coreq: MA 301 or 312. 3(3-0) F,S. Numerical computations with digital computers; floating point arithmetic and implications of round-off error. Algorithms and computer techniques for the numerical solution of problems in: function evaluation; zeros of functions; interpolation; numerical differentiation and integration; linear systems of equations; curve fitting; solutions of non-linear equations; numerical solutions of ordinary differential equations.

CSC 311 Data Structures. Preq: CSC 102 and 112. 3(3-0) F,S. Fundamental algorithms associated with data structures. Topics are: linear lists including stacks, queues and deques; sequential and linked allocation of linear lists; circular lists, doubly-linked lists, arrays and orthogonal lists; trees including traversal of binary trees and binary representation of trees; lists and garbage collection; multilinked structures; dynamic storage allocation.

CSC 312 Computer Organization and Logic. Preq: CSC 112, 322. 3(3-0) F,S. Application of Boolean algebra to combinational circuit design problems. Sequential circuits. Organization and functional design of simplified computer components such as the memory unit, the arithmetic and logic unit and input-output devices. Architecture of computing systems. Functional characteristics of I/O devices, data channels, interrupt and priority systems. Microprogram control. Hardware-software tradeoffs and firmware.

CSC (E) 321 Computer Graphics. 3(2-2) S. (See engineering, general courses, page 257.)

CSC 322 Applied Algebraic Structures. Preq: MA 231 or 405. 3(3-0) F,S. Naive set theory, order and equivalence relations, functions, partitions, operations and congruences. Boolean algebra, semi-group, group and graph theory. Logic of propositions, first order predicate calculus, models for an axiomatic theory. Some applications and examples of these algebraic structures selected from formal language description, data structures, file organization, information retrieval, games, switching circuits, neural nets, sequential machines, artificial intelligence, syntatic structure of arithmetic expressions and theory of algorithms.

CSC 351 Principles of Programming - LISP. Preq: CSC 311. 1(1-0) S. The programming language LISP and its application to the processing of general list structures, with emphasis on recursive programming. Assignments demonstrate the power and versatility of LISP. (Grading S-NC).

CSC 401 Sorting and Searching. Preq: CSC 311. 3(3-0) F. Sorting and searching procedures and their implications for file structure design. On-line and batch processing systems.

CSC 411 Introduction to Simulation. Preq: MA 312 and ST 371 or equivalent. 3(3-0) F. Introduces simulation concepts and methodology to CSC and other students. Modeling and computational techniques, Monte Carlo methods, and interactive simulation. Projects are developed in areas of student interest.

CSC 412 Introduction to Computability, Language and Automata. Preq: CSC 322. 3(3-0) S. Sequential machines as abstractions of digital computers described by state-transition graphs. Sequential machine as language acceptors and as the finite control of a Turing machine. Chomsky classification of languages and machines. Universal Turing machines and the halting problem. Church's thesis. Recursive functions. Heuristic argument that a function is recursive if and only if it is Turing computable. The semi-group word problem and tree searching algorithm. Applications to artificial intelligence, perceptron simulation, game playing, syntactic analysis algorithms.

CSC 421 Computer Systems for Management. Preq: CSC 311. 3(3-0) F. Management information systems (MIS). The data base approach. Characteristics of successful systems and dimensions of system evolution and evaluation. Models versus modeling in MIS design. A model of information flow and its economics. Profitability and risk analysis in corporate financial systems. Production/inventory control through MIS. Operations research techniques for MIS development. Management's MIS consultant. The general purpose MIS. Human factors in design and implementation of the new company MIS.

CSC (MA) 427 Introduction to Numerical Analysis I. Preq: MA 301 or 312 and programming language proficiency. 3(3-0) F. For undergraduate students in any department who wish to learn the theory and practice of computational procedures using a digital computer. Topics include: approximation of functions by interpolating polynomials; numerical differentiation and integration; solution of systems of ordinary differential equations including both initial valve and boundary value problem. Computer applications and techniques.

CSC (MA) 428 Introduction to Numerical Analysis II. Preq: MA 231 or 405 and programming language proficiency. 3(3-0) S. For students who wish to learn computational procedures using digital computers. Topics include: solution of linear and nonlinear equations; matrices and eigenvalue calculations; orthogonal polynomials and Gaussian quadrature; curve fitting and function approximation by least squares; smoothing formulas; minimax approximations. [CSC (MA) 427 is not a prerequisite.]

CSC 431 Information Retrieval. Preq: CSC 311. 3(3-0) S. Organization and retrieval of information in natural language form. Analysis of information content by statistical, syntactic and logical methods. Authomatic clustering and statistical association methods. Dictionary construction and utilization. File organization and retrieval techniques for text processing systems. Evaluation of retrieval effectiveness. Applications to both document retrieval and question answering systems.

CSC 432 Introduction to Digital Signal Processing. Preq: CSC 302, ST 371, and MA 231 or 405. 3(2-2) S. Use of digital computers in the processing of analog signals. The uses of operational amplifiers in SAH, DAC, and ADC's and other data acquisition devices. The discrete Fourier transform, digital filters and other algorithms used in processing time series.

CSC 462 Computing for the Social Sciences. Preq: ST 311 or equivalent. 3(3-0) S. To acquaint the social scientist with the information processing capabilities of a computer. Examples and problems from the social sciences. Topics include: a higher level programming language, procedures for accessing statistical packages and other library routines, and data management using disks and tapes. (CSC majors may not receive credit.)

CSC 495 Special Topics in Computer Science. Preq: CI. 1-6 F,S. Consists of the following types of study: readings in the literature of computer science, introductory research projects, major computer programming projects, seminars, or new course development. Work may be done in any CSC area such as software, hardware utilization, programming languages, numerical methods or telecommunications.

CSC 499 Undergraduate Research in Computer Science. Preq: CI. 1-6 F,S. Independent investigation of a research problem under faculty supervision.

CSC 501 Design of Systems Programs. Preqs: CSC 311, 312 (CSC 301 recommended). 3(3-0) F. Review of batch process systems programs, their components, operating characteristics, user services and their limitations. Implementation techniques for parallel processing of input-output and interrupt handling. Overall structure of multiprogramming systems on multi-processor hardware configurations. Details on addressing techniques, core management, file system design and management, system accounting, and other user-related services. Traffic control, interprocess communication, design of system modules, and interfaces. System updating, documentation and operation.

CSC 502 Computational Linguistics. Preq: CI. 3(3-0) S. Use of a symbol manipulation language (SNOBOL 4) in solving non-numeric problems. Study of generative grammars, including finite-state, context-free, context-sensitive, and transformational grammars. Syntactic analysis by computers: algorithms and existing analysis systems for English. Computational semantics. Information retrieval and question-answering systems. Open to CSC and other students.

CSC 504 Application of Linguistic Techniques to Computer Problems. Preq: CSC 502. 3(3-0) S. Semiotics and programming languages. Comparison of semantic theories. Representation, classification and interpretation of scenes and other multi-dimensional illustrations. Design of a formal language for describing two-dimensional geometric figures, such as flow charts, chemical structures and logic diagrams. Characterization of programming languages according to the theory of transformational grammar.

CSC 511 Artificial Intelligence. Preq: CSC 311. 3(3-0) F. Definition of heuristic versus algorithmic methods, rationale of heuristic approach, description of cognitive processes. Objectives of work in artificial intelligence, simulation of cognitive behavior. Heuristic programming techniques. Survey of examples from representative application areas. The mind-brain problem and the nature of intelligence. Individual projects.

CSC 512 Metaprograms. Preq: CSC 311 (CSC 412 recommended). 3(3-0) S. The techniques used in the design and implementation of compilers. Introduction to formal grammars and relations concerning a grammar. Detailed study of algorithms for lexical scanners, top-down recognizers, bottom-up recognizers for simple precedence grammars, operator precedence grammars, higher order precedence grammars, and bounded-context grammars. Run-time storage organization for a compiler including symbol tables, internal forms for source programs, semantic routines, error recovery and diagnostics, code generation and optimization, and interpreters.

CSC 522 Formal Languages and Syntactic Analysis. Preq: CSC 412 (CSC 512 recommended). 3(3-0) F. Formal languages and their relation to automata: languages and their representation, grammars, finite automata and regular grammars context free grammars and pushdown automata, type O grammars and Turing machines, the halting problem, context-sensitive grammars and linear bounded automata, and operations on languages.

CSC (MA) 529 Numerical Analysis I. 3(3-0) F. (See mathematics, page 305.)

CSC (MA) 530 Numerical Analysis II. 3(3-0) S. (See mathematics, page 305.)

CSC 532 Artificial Intelligence II. Preq: CSC 511, a course in mathematical logic. 3(3-0) S. Emphasizes pattern recognition, theorem proving, game playing, learning and heuristic programming. Students assigned computer projects illustrating theoretical concepts.

CSC (MA) 536 Theory of Sequential Machines. (See mathematics, page 305.)

CSC (MA) 537 Theory of Computability. Preq: CSC 412 or grad. standing. 3(3-0) S. Effective computability. Turing machines. Primitive recursive functions. The u operator. u-recursive functions. Godel numbering. Equivalence of Turing machines and u-recursion. Undecidable predicates. Universal Turing Machines. Other formulations of the concept of effective computability.

CSC (OR) 562 Advanced Topics in Computer Simulation. Preq: ST 421 or equivalent; or grad. standing. 3(3-0) S. Basic simulation methodology; general principles of the Monte Carlo Method: random number generation, accuracy, variance reduction methods, classical applications in mathematics and physics; simulation of queueing systems; development of a research problem in depth where computer simulation is required 1) to provide insight through experientation with a model, 2) to provide approximate answers and practical solutions, and 3) to test the model and the solutions.

CSC (MA) 582 Special Topics in Numerical Solution of Linear Algebraic Equations. Preq: MA 405 or equivalent and a knowledge of computer programming. 3(3-0) S. A mathematical and numerical investigation of direct iterative and semi-iterative methods for the solution of linear systems. Methods for calculating eigenvalues and eigenvector of matrices.

CSC (MA) 583 Special Topics in the Numerical Solution of Ordinary Differential Equations. 3(3-0) S. (See mathematics, page 306.)

CSC (MA) 584 Special Topics in the Numerical Solution of Partial Differential Equations. 3(3-0) F. (See mathematics, page 306.)

CSC 585 (OR 585) Graph Theory. 3(3-0) F. (See operations research, page 330.)

CSC 595 Special Topics. Preq: CI. 1-6 F,S. Topics of current interest in CSC not covered in existing courses.

FOR GRADUATES ONLY

CSC 603 Computational Semantics. 3(3-0)

CSC (MA) 635 Functional Analysis and Numerical Analysis. (3-0) S.

Crop Science

FOR UNDERGRADUATES

CS (SSC) 112 Perspectives in Agronomy. Preq: Fr. or soph. standing and/or CI. 2(0-5) S. Different facets of crops, soils, and agronomic production. Pertinent features of the materials used in agronomic production and the processing of agronomic products provide understanding of the relationship of agronomy to related fields. Field trips and tours. Long

CS 211 Crop Science. Preq: BS 100. 4 (4-0) F,S. Fundamental morphological, physiological and reproductive features of crop plants and the management practices for economical production. Emery, Fike

CS 214 Crop Science Laboratory. Preq. or coreq: Any CS course. 1 (0-2) F,S. (Can be taken only once for credit.) Evaluates methods of identifying and dealing with the problems of growing and managing crop plants. Emery, Fike

CS 312 Pastures and Forage Crops. Preqs: BS 100, SSC 200 recommended. 3(3-0) S. Production and preservation of the principal forage crops, with attention to the development and maintenance of pastures. Chamblee

CS 315 Turf Management. Preq: BS 100. 3(2-2) S. Production, utilization, and management of turf grasses. The growth responses of different plant species to natural and imposed environmental factors. Interrelationships of climate, soil, biotic factors, and plants are examined in the field, laboratory, and classroom. Gilbert

CS (BO) 402 Economic Botany. Preq: BO 200. 3(2-3) S. Emphasis is on plants and human affairs. All phases of the inter-relationships of the plant world and the life history incipient to modern human cultures. Includes plants and plant products, beneficial and harmful, that man has used as necessities of life, as ameliorants contributing to his well-being, and as raw materials for industry. Ornamentals are excluded. Timothy

CS 411 Environmental Aspects of Crop Production. Preq: BO 421. 2(2-0) F. The productivity and quality of crops in relation to all environmental factors, including man. Disorders caused by physical and biotic environmental stresses and the role of these environmental factors in normal crop development are emphasized. Utilization and manipulation of the environment for the continued improvement of crops are discussed. Patterson

CS 413 Plant Breeding. Preq: GN 411. 2(2-0) S. Discussion of reproductive systems of higher plants; the genetic basis for plant improvement and the selection, evaluation, and utilization of crop varieties. Emery

CS 414 Weed Science. Preq: CH 220 or equivalent. 3(2-2) F. Principles and practices involved in cultural and chemical weed control. The chemistry, properties and effects of herbicides on plants. Identification of common weeds, principles and practices of herbicide application and application equipment, and proper use of herbicides are given in laboratory. Balances fundamental with practical information. Worsham

CS (SSC) 462 Soil-Crop Management Systems. 3(2-3) S. (See soil science, page 367.)

CS 490 Senior Seminar in Crop Science. Preq: Sr. standing. 1(1-0) S. The collection, organization, written preparation, and oral delivery of scientific information. Emery

FOR GRADUATES AND ADVANCED UNDERGRADUATES

CS 511 Tobacco Technology. Preq: BO 421 or equivalent. 2(2-0) S. Special problems concerned with the tobacco crop. The latest research problems and findings dealing with this important cash crop. Collins

CS 513 Physiological Aspects of Crop Production. Preq: BO 421. 3(3-0) S. Emphasizes pertinent physiological processes associated with crops and crop management such as plant growth, maturation, respiration and photoperiodism. Relationship of the environment to maximum crop yields. (Offered S 1976 and alt. years.) Fike

CS (HS) 514 Principles and Methods in Weed Science. Preqs: CS 414 or equivalent. 3(2-2) S. The losses caused by the ecology of weeds, biological control, basic concepts of weed management, herbicide-crop relationships and herbicide development. Introduction to greenhouse and bioassay techniques and field research techniques. Monaco, Schrader

CS (GN, HS) 541 Plant Breeding Methods. Preqs: GN 506 and ST 511. 3(3-0) F. Methods of plant breeding as related to principles and concepts of inheritance. Henderson, Wernsman

CS (GN, HS) 542 Plant Breeding Field Procedures. Preq: CS (GN, HS) 541. 2(0-4) Sum. Laboratory and field study of the application of the various plant breeding techniques and methods used in the improvement of economic plants. (Offered Sum. 1975 and alt. years.) Harvey

CS (GN) 545 Origin and Evolution of Cultivated Plants. Preq: CS 541 or GN 540. 2(2-0) S. Discussion topics include: mankind as a potential cultivator; man's anatomy, physiology and alimentary needs; origins of cultivation; spread of agriculture in terms of various theories; interactions of crops and environments with reference to crop evolution; special attributes of cultigens; modern aspects of evolution breeding. (Offered S 1976 and alt. years.) Lee

CS 591 Special Problems. Preq: CI. Credits Arranged. Crop science problems may be selected or assigned. Emphasis on review of recent and current research. Graduate Staff

FOR GRADUATES ONLY

CS (GN, HS) 613 Plant Breeding Theory. 3(3-0) S. (Offered S 1976 and alt. years.)

CS (HS, SSC) 614 Herbicide Behavior in Plants and Soils. 3(3-0) F. (Offered F 1975 and alt. years.)

CS 690 Seminar. 1(1-0) F,S.

CS 699 Research. Credits Arranged.

Design

DN 101, 102 Environmental Design I, II. Preqs: (101) Majors in design or consent of dean; (102) DN 101. 3(0-7) F,S. Investigation of the sensory environment as a design determinant. Emphasis is on individual discovery by the student who must function in problem-formulating and problem-solving processes. Course develops technical skills simultaneously with the development of conceptual models. Staff

DN 111, 112 Perception and Communication I, II. Preqs: (111) Majors in design or consent of dean; (112) DN 111. 3(0-7) F,S. Increases perceptual awareness and communication skills through exercises in various communications media. Staff

DN 121, 122 History of Design I, II. Preq: (122) DN 121. 3(3-0) F,S. Critical study of related design fields from prehistoric periods to modern era with reference to social, political, technological movements. Reuer

DN 201, 202 Environmental Design III, IV. Preqs: (201) DN 102; (202) DN 201. 4(1-9) F,S. Introduction to architecture, landscape architecture and product design through environmental studies and investigation of materials and processes. Staff

DN 211, 212 Visual Communication I, II. Preqs: (211) DN 112; (212) DN 211. 2(0-6) F,S. Visual communications processes as they support design activities. Two- and three-dimensional studies and exercises as related to the design process. Staff

DN 311, 312 Advanced Visual Laboratory I, II. Preqs: DN 111, 112, 211, 212. 2-4 F,S. Extension of problems introduced in first- and second-year drawing at advanced level. Problems involve human figure and its environment, also investigate techniques to increase student's ability to express ideas in varied forms. Staff

DN 411, 412 Advanced Visual Laboratory III, IV. Preqs: DN 311, 312. 2-4 F,S. Advanced problems in painting, sculpture, graphics, photography. Staff

DN 422 History of Design III. Preq: DN 122. 3(3-0) F,S. Specialized historical studies in design fields. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

DN 505 Introduction to Design as Task. Preq: Grad. standing in design or permission of dean. 3(0-6) F,S,Sum. Studio course approaching design primarily as task. Program of exercises acquaints student with the defining of tasks and their interpretation within a designer's power of action. Graduate Staff

DN 506 Introduction to Design as Technique. Preq: Grad. standing in design or permission of dean. 3(0-6) F,S,Sum. Studio course approaches design primarily as technique. A program of exercises acquaints student with available techniques and their relationship to existing and potential tasks. Graduate Staff

DN 507 Introduction to Design as Practice. Preq: Grad. standing in design or permission of dean. 3(3-0) F,S, Sum. Seminar course provides overview of current design concepts and activities. Presentations and discussion by Design faculty and design practitioners. Graduate Staff

DN 511, 512 Advanced Visual Laboratory V, VI. Preq: Grad. standing. 2-4, F,S. Advanced experimental studies in visual phenomena related to design.
Graduate Staff

DN 541 Seminar on Ideas in Design. Preq: Graduate standing. 2(2-3) F,S. Examination of aesthetics and the relationships of philosophic thought to design.
Kamphoefner

FOR GRADUATES ONLY

DN 611, 612 Advanced Visual Laboratory VII, VIII. 2(0-6) F,S.

Economics

(Also see Accounting.)

FOR UNDERGRADUATES

EC 201 Economics I. 3(3-0) F,S. Development of the modern economy and the history of economic thought to help understand economic problems. The market system as a means of cooperation and as facilitator of individual choice and efficiency in resource use. Inflation, employment, and growth in the national economy and their management by fiscal and monetary policies. Economic theories are presented to clarify policy issues and empirically resolvable controversies.

EC 202 Economics II. Preq: EC 201. 3(3-0) F,S. Analysis of problems of contemporary national and international economics. Topics include the public economy, the financial system, industrial organization, pricing of factors of production, international trade, economic growth and development, and comparative economic systems.

EC 212 Economics of Agriculture. Preq: MA 111. 3(3-0) F,S. The functioning of the agricultural economy including the allocation of resources in agricultural production, relationships between agriculture and other segments of the economy, and current problems within the agricultural sector.

EC 301 Production and Prices. Preq: MA 112 and EC 201 or 212. 3(3-0) F,S. The functioning of the market economy. The role of prices in determining the allocation of resources, the functioning of the firm in the economy, and forces governing the production of economic goods.

EC 302 Aggregate Economic Analysis: Theory and Policy. Preqs: EC 201 and MA 112. 3(3-0) F,S. Factors determining the national income. Relates the economic behavior of households, business firms, and government to the determination of total output, employment, the price level and other aggregate economic variables. Problems of public policy-making in achieving full employment and a stable price level.

EC 303 Farm Management. Preq: EC 201 or 212. 3(2-2) F,S. Basic economic principles including the use of budgeting, linear programming, systems analysis and other techniques in determining what, how and how much to produce under various economic conditions.

EC 304 Financial Institutions. Preq: EC 201. 3(3-0) F,S. The flow-of-funds among the principal financial institutions in the American economy; the behavior of the money and capital markets; and the allocation of savings flows into investment expenditures.

EC 307 Business Law I. Preq: EC 201 or 212. 3(3-0) F,S. The main principles of law affecting the conduct of trade as it is affected by contracts, agency and property ownership. Major areas include criminal law, tort law, contract, agency, real and personal property, wills and estates.

EC 308 Business Law II. Preq: EC 307. 3(3-0) F,S. The main principles of law affecting the conduct of trade and industry including real and personal property, mortgages, insurance, wills and estates, sales, business organizations and bankruptcy.

EC 310 Economics of the Firm. Preq: EC 201 or 212. 3(3-0) F,S. The economic setting within which the business firm makes decisions and an application of economic analysis to these decisions. Economics in managerial decision making.

EC 311 Agricultural Markets. Preq: EC 201 or 212. 3(3-0) S. The agricultural marketing system and the current economic forces affecting its structure and efficiency; decision making by agricultural business firms including integration and interfirm relationships; effects of monopoly in marketing relative to government policies of control. Visits to marketing firms and practical problems illustrating firm decisions. A laboratory period in alternate weeks beginning with the second full week of classes. Students examine individually the marketing problems associated with the commodity of their choice.

EC 313 Marketing Methods. Preq: EC 201 or 212. 3(3-0) F,S. The functions of marketing for goods and services in the consumer, industrial and government markets. Emphasis on the role of marketing in our free exchange economic system. Areas studied are the activities of market research, advertising, pricing, channels of distribution, agricultural marketing, international marketing, and the marketing of services. "Consumerism," its causes and its probable future.

EC 317 Introduction to Methods of Economic Analysis. Preq: EC 301. 3(3-0) F,S. The fundamentals of quantitative methods and economic models in the application to economic and industrial problems. Study of economic variables and their parameters lays the groundwork for later study of firm and consumer behavior. Analysis of the supply and demand sides of the market equation. Examination of the economic structure from the standpoint of multiple markets and the general economy.

EC 325 Industrial Management. Preq: EC 201 or 212. 3(3-0) F,S. Principles of management and the management process within the industrial organization. The relation of the financial, marketing, organization, and communication systems to the operations function. Quantitative decision methods for operations planning, organizing, and control. The student manages the operations system of a firm in a simulated environment.

EC 326 Personnel Management. Preq: EC 201 or 212. 3(3-0) F,S. The scientific management of manpower from the viewpoint of the supervisor and the personnel specialists; a study of personnel policy and a review of the scientific techniques regarding the specific problems of employment, training, promotion, transfer, health and safety, employee service and joint relations.

EC 332 Industrial Relations. Preq: EC 201 or 212. 3(3-0) F,S. The nature and functions of collective bargaining. The objectives and tactics of both labor and management within public policy guidelines. An examination of labor contracts and their implications for labor and management. Emphasis on the impact of change, economic and technological.

EC (HI) 370 The Rise of Industrialism. Preq: EC 201 or 212. 3(3-0) F. The pattern of historical development of modern industrial economy. Capitalism origins in 16th century England are related to succeeding developments in the overseas colonial empire and in other areas influenced by that development.

EC (HI) 371 Evolution of the American Economy. Preq: EC 201 or 212. 3(3-0) S. Advances of modern industrialization are related to the development of America. Contemporary problems and issues are analyzed with reference to their origins in the historical growth of the economy.

EC 401 Economic Analysis for Nonmajors. Preq: EC 201 or 212. 3(3-0) F,S. Intermediate economic theory of firm, household and market behavior primarily for graduate students desiring an economics minor at the master's level. Students with adequate background in economics and mathematics elect EC 501 instead. Topics include demand, production and cost theory, market equilibrium under competitive and non-competitive conditions, an introduction to input-output and general equilibrium theory, the spatial arrangement of economic activity and problems of economic efficiency.

EC 410 Public Finance. Preq: EC 301. 3(3-0) F. A micro-economic analysis of the rationale for public expenditure and taxation. Topics include externalities, pollution and public policy, income redistribution and public welfare, public goods, collective choice and political institutions, public budgeting techniques and cost-benefit analysis, taxation and tax policy, state-local finance and fiscal federalism.

EC 413 Competition, Monopoly and Public Policy. Preq: EC 301. 3(3-0) F,S. The effect of modern industrial structure on competitive behavior and performance, considering theories of contemporary price and workable competition. Evaluation of the legislative content, judicial interpretation and economic effects of the anti-trust laws.

EC 415 Farm Appraisal and Finance. Preq: EC 303 or 310. 3(2-2) F. The earnings, market and cost approaches to real estate valuation with practice in the application of current appraisal procedures to rural property. Criteria and techniques for the financial management of a farm. Topics include existing sources and terms of capital, forms of business organization and methods of credit analysis.

EC 420 Corporation Finance. Preq: EC 201 or 212, and ACC 260. 3(3-0) F,S. The principal areas of managerial finance including the techniques necessary to make decisions. Attempts to integrate finance and other functional areas that a corporation must deal with. Relevant macro economics topics. Cases and problems dealing with important topics are analyzed and discussed.

EC 422 Investments and Portfolio Management. Preqs: EC 201 and 317 or ST 311. 3(3-0) F,S. Analysis of investment process problems including security analysis and emphasizing portfolio management. Brief explanation of traditional thinking and an examination of the modern revolution in investments which emphasizes a quantitative framework to achieve the goal of performance. After describing what an individual investor faces in making decisions, the question of professional management as an alternative is viewed critically.

EC 430 Agricultural Price Analysis. Preq: EC 301. 3(3-0) F. Principles of price formation; the role of price in the determination of economic activity; the interaction of cash and future prices for agricultural commodities; methods of price analysis, construction of index numbers, analysis of time series data including the estimation of trend and seasonal variations in prices.

EC 431 Labor Economics. Preq: EC 301. 3(3-0) F,S. An economic approach to the labor market and its problems including unemployment and the determination of

wages, hours and working conditions under various labor market structures. The economic effects of trade unions. Introduction to human capital theory.

EC 435 Urban Economics. Preq: EC 301. 3(3-0) S. Application of land use and location theory to urban structure and centralized economic activity. Analysis of trends in urbanization and suburbanization. Urban poverty, housing, transportation, pollution, and financial problems.

EC 436 Environmental Economics. Preq: EC 301. 3(3-0) F. The usefulness of economics in understanding pollution, congestion, conservation and other environmental problems. Relevant economic tools such as pricing schemes, abatement cost curves, damage functions and benefit-cost analysis. Pollution taxes, regulations and subsidies considered in designing alterations in the incentive system. Public policy alternatives examined in the context of non-market decision making.

EC 440 Economic Development. Preq: EC 201 or 212. 3(3-0) S. The institutional background required for national economic development. The conditions apparent for past growth of nations are compared with conditions in presently retarded nations. Conclusions from this comparison provide introduction to the theoretical models of growth.

EC 442 Evolution of Economic Ideas. Preq: EC 202 or 212. 3(3-0) S. The general development of economic ideas from ancient times through Keynes. Emphasis on the classical school and developments thereafter. Though chronological in presentation, the course will review the evolution of economic ideas in the context of the changes in technology and the increasing complexity of economic activity.

EC 448 International Economics. Preq: EC 301. 3(3-0) F. Trade, investment, monetary relations and certain aspects of economic development. Emphasis on analytical and policy approaches with some study of specific international organizations.

EC 451 Introduction to Econometrics. Preqs: EC 301, 302 and 317 or ST 311. 3(3-0) F,S. The measurement, specification, estimation and interpretation of functional relationships through single equation least-square techniques. Simple and multiple regression, curvilinear regression and various transformations will be used to measure: demand, cost, production, consumption and investment relationships.

EC 475 Comparative Economic Systems. Preq: EC 201 or 212. 3(3-0) F. Concentration on capitalist or market economies which will be contrasted with collectivist types of systems. Emphasis on the Soviet economy.

EC (TX) 482 Sales Management for Textiles. 3(3-0) S. (See textile technology, page 378.)

EC 490, 491 Senior Seminars in Economics. Preqs: EC 301 and 302 and 317 or ST 311 (plus two courses from list of restricted EC electives). 3(3-0) F,S. The terminal EC courses in which undergraduates are assisted in summarizing training, and improving capacity to recognize problems and select logically consistent means of solving problems. This is done on a small-group and individual basis.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

EC 501 Price Theory. Preqs: MA 112 and EC 301. 3(3-0) F,S. An intensive analysis of the determination of prices and of market behavior, including demand, cost and production, pricing under competitive conditions and pricing under monopoly and other imperfectly competitive conditions.

EC 502 Income and Employment Theory. Preqs: MA 112 and EC 301 and 302. 3(3-0) F,S. The methods and concepts of national income analysis with particular reference to the role of fiscal and monetary policy in maintaining full employment without inflation.

EC 515 Water Resources Economics. Preq: EC 401 recommended. 3(3-0) S. Applying economic principles to water resources allocation. Attention to how to effect maximum economic efficiency in the use of a resource that is no longer a free good, under the consideration of the goals of the public and private sectors of the enterprise economy. Both economic and political consequences of decision-making.

EC 521 Markets and Trade. Preq: EC 301 or 401. 3(3-0) F. Emphasizes the space, form and time dimensions of market price and the location and product combination decisions of firms. Consideration to the ways in which non-price factors and public-policy choices influence firm behavior and the efficiency of marketing systems. Application of these models to agricultural, industrial and public-service questions, including the relationship between resource availability and the spatial arrangement of economic activity.

EC 523 Planning Farm and Area Adjustments. Preq: EC 301, 303, or 401. 3(2-2) S. The application of economic principles to production problems on typical farms in the state; methods and techniques of economic analysis of the farm business; application of research findings to production decisions; development of area agricultural programs.

EC 525 Management Policy and Decision Making. Preq: EC 301 or 401. 3(3-0) F,S. Modern management processes used in making top-level policies and decisions; an evaluation of economic, social and institutional pressures, and of the economic and noneconomic motivations, which impinge upon the individual and the organization. The problem of coordinating the objectives and the mechanics of management.

EC 533 Agricultural Policy. Preq: EC 301 or 401. 3(3-0) S. The agricultural policy and action programs of the federal government as regards both input supply and commodities, analysis of objectives, principal means and observable results as regards resource use and income distribution within agriculture, and between agriculture and the rest of the economy. Appraisal of alternative policy proposal effects on domestic and foreign consumption.

EC 535 Social Science Concepts in Managerial Processes. Preq: Six hours EC. 3(3-0) S. Interrelationships among economic concepts and social sciences concepts in managerial processes of clarifying goals, discovering alternatives and choosing courses of action. Cases used to compare contributions of theoretical concepts from economics, political science, social psychology, sociology and management science to managerial processes. Theoretical concepts are drawn from readings in the various disciplines.

EC 550 Mathematical Models in Economics. Preq: EC 301, 302, MA 212 and MA 405 recommended but not required. 3(3-0) F. Formal properties of economic models. The theory of individual economic units as a special case in the theory of inductive behavior. Mathematical discussion of the theories of the consumer and of the firm and welfare economics shows the relevance of constrained maxima and minima, set theory, partially and simply ordered systems, probability theory and game theory to economics.

EC 551 Agricultural Production Economics. Preqs: MA 112 and EC 301 or 401. 3(3-0) F. An economic analysis of agricultural production including: production functions, cost functions, programming and decision-making principles. Application of these principles to farm and regional resources allocation and to the distribution of income to and within agriculture.

EC 555 Linear Programming. Preqs: MA 231 or 405 and EC 301 or 401. 3(3-0) F,S. Recent developments in the theory of production, allocation and organization; optimal combination of integrated productive processes within the firm; applications in the economics of industry and of agriculture.

EC (ST) 561 Intermediate Econometrics. Preqs: EC 501 and ST 513. 3(3-0) S. Emphasizes the formalization of economic hypotheses into testable relationships and the application of appropriate statistical techniques with attention to procedures applicable for single equation stochastic models expressing microeconomic and macroeconomic relationships. Statistical considerations that are relevant in working with time series and cross-sectional data in economic investigations. Survey of simultaneous equation models and the available estimation techniques.

EC 570 Analysis of American Economic History. Preq: EC (HI) 371 or grad. standing. 3(3-0) F. Stresses the application of economic analysis to the formulation and testing of hypotheses concerning economic growth and development in the historical context. Problems analyzed drawn primarily from American economic history.

EC (SOC) 574 The Economics of Population. Preq: EC 301 or 401. 3(3-0) S. Pre-Malthusian thought through contemporary population theories. Introduction to data sources, statistical tools and methodology for economic analysis in demography. There follows an intensive treatment of microeconomic models of fertility. In macroeconomics economic demographic models are examined and implications for public policy are developed. Underpopulation, overpopulation, optimum growth rate and incentive schemes.

EC (TX) 585 Market Research in Textiles. 3(3-0) S. (See textile technology, page 378.)

EC 590 Special Economics Topics. Preq: CI. Maximum 6. An examination of current problems on a lecture-discussion basis. Course content varies as changing conditions require new approaches to deal with emerging problems.

EC 598 Topical Problems in Economics. Preq: CI. 1-6. An investigation of topics of particular interest to advanced students under faculty direction on a tutorial basis. Credits and content vary with student needs.

FOR GRADUATES ONLY

EC 600 Advanced Price Theory. 3(3-0) F.

EC 601 Prices, Value and Welfare. 3(3-0) S.

EC 602 Advanced Income and Employment Theory. 3(3-0) F.

EC 603 History of Economic Thought. 3(3-0) F.

EC 604 Monetary Economics. 3(3-0) S.

EC 606 Industrial Organization and Control. 3(3-0) F.

EC 610 Theory of Public Finance. 3(3-0) S.

EC 625 Long Range Planning in Business and Industry. 3(3-0) S.

EC 630 Labor Economics and Manpower Problems. 3(3-0) S.

EC 631 Human Capital. 3(3-0) F.

EC 640 Analysis of Economic Development. 3(3-0) S.

EC 641 Agricultural Production and Supply. 3(3-0) S.

EC 642 Consumption, Demand and Market Interdependency. 3(3-0) F.

EC 645 Planning Programs for Economic Development. 3(3-0) F,S.

EC 648 Theory of International Trade. 3(3-0) S.

EC 649 Monetary Aspects of International Trade. 3(3-0) S.

EC 650 Economic Decision Theory. 3(3-0) F,S.

EC (ST) 651 Econometrics. 3(3-0) F.

EC (ST) 652 Topics in Econometrics. 3(3-0) S.

EC 699 Research in Economics. Credits Arranged.

Education

FOR UNDERGRADUATES

ED 100 Introduction to Industrial Education. 2(2-0) F. The framework of vocational education as it relates to the historical and legislative development, programs and purposes in industrial and technical education. Emphasis upon the current status of industrial and technical education in the nation, state and community. Program visitations and observations. Parker

ED 101 Orientation. 0(1-0) F. New freshmen and transfer students (Math Science Education) are required to attend one hour per week during the fall semester. Activities help establish good study habits and adjust to university life. Staff

ED 102 Objectives in Agricultural Education. 1(1-0) F,S. Helps understand the purpose of agricultural education at North Carolina State. Also, develops an understanding of purposes of vocational agriculture and other programs of education in agriculture. Staff

ED 203 Introduction to Teaching Mathematics and Science. 3(2-3) F,S. For prospective teachers of mathematics/science at the secondary school level. Emphasis on different modes of instruction and instructional strategies. Each prospective teacher designs and teaches a lesson to students in the school at which he is a teacher assistant. (Offered S only for science education majors.) Staff

ED 205 Introduction to Teaching Humanities and Social Sciences. 3(2-3) F,S. For prospective teachers in the school curricular areas of social studies, English, speech, and modern languages. Emphasis on differing aspects and procedures of instruction and an analysis of the competencies required of teachers. Lab. observation and work with children and youth in a variety of educational settings, including an extended period in one curricula area. Parramore

ED (PHI) 304 Philosophy of Education. 3(3-0) F,S. (See philosophy, page 331.)

ED 305 Analysis of Technical Education Programs and Course Construction. Preq: ED 100 or equivalent. 3(3-0) S. Selecting and analyzing suitable teaching activities and arranging such material into a functional instructional order. Instruc-

tional units prepared will be based on an analysis of a technical occupation or activity. A detailed course of study will be prepared. Shore

ED 313 Contemporary Vocational Agriculture. 3(3-0) F,S. The contemporary program is examined in relation to changing and expanding career opportunities in agricultural education. The continuing adjustment of the program objectives, curriculum organization, content of courses, teaching practices, instructional resources and evaluation emphasis in modern programs in vocational agriculture. Prerequisite for student teaching in agricultural education. Bryant

ED (SOC) 318 Introduction to the Sociology of Education. 3(3-0) F. (See sociology, page 362.)

ED 327 History and Philosophy of Industrial and Technical Education. Preq: ED 100. 3(3-0) F. Place, function and changing concepts of industrial and technical education in America. Economic, sociological and psychological aspects. Parker, Shore

ED 344 School and Society. Preq: Jr. or sr. standing. 3(3-0) F,S,Sum. The interrelationship between the school and other institutions, values, and patterns of thought in American society. Ivie

ED 405 Industrial and Technical Education Shop and Laboratory Planning. Preq: Sr. standing, six hours of drawing and design. 3(3-0) F. Principles and techniques of planning and organizing shop and laboratory facilities. Problems of locating and equipping vocational schools; the planning and layout of shops and related technology laboratories and classrooms. Individual and group assignments on planning and layout of post-secondary school buildings. Shore

ED 411 Student Teaching in Agriculture. Preqs: ED 344, PSY 304, sr. standing and admission to teacher education. 8(2-15) F,S. The first six or seven weeks will be on-campus with remainder of the semester spent in a high school doing full-time student teaching. The student teacher gains experience in all phases of the vocational agriculture program, including community study, adult education and home supervision. Supervision by the local agriculture teacher and a member of the agricultural education staff. Bryant

ED 412 Teaching Adults. 2(2-0) F,S. Principles of effective teaching applied to adults. Experience in organizing and conducting groups for discussion of local problems. Miller

ED 413 Planning Educational Programs. 2(2-0) F,S. Principles of program planning applied to educational programs in agriculture. Resources needed for adequate planning. Field work in planning programs. Staff

ED 420 Principles of Guidance. Preq: ED 344. 3(3-0) F,S. An overview of philosophies and principles of guidance services and of the classroom teacher's role in helping the school to realize the goals of developmental guidance programs. Topics include: philosophy, history and models of guidance, principles of counseling, accumulation and use of appraisal and information data, career planning, and placement. Staff

ED 421 Principles and Practices in Industrial Cooperative Training. Preqs: ED 327, 344. 3(3-0) F,S. The developments, objectives and principles of industrial cooperative training. The organization, promotion and management of programs in this area of vocational education. Smith

ED 422 Methods of Teaching Industrial Subjects. Preqs: PSY 304, ED 344. 3 or 4(3-2) F. For majors only. Effective methods and techniques of teaching industrial

subjects. Emphasis is given to class organization; student teacher planning; methods of teaching manipulative skills and related information; lesson planning; shop safety; and evaluation. Teaching problems analyzed following directed observations in the public schools. Staff

ED 423 Methods and Materials in Teaching Modern Languages. Preqs: PSY 304, ED 344, sr. standing and admission to teacher education with a major in modern languages. 3(3-0) F,S. Methods of teaching and the use of appropriate instructional materials and audiovisual equipment. Reynolds

ED 424 Student Teaching in Modern Languages. Preqs: PSY 304, ED 344, sr. standing and admission to teacher education with a major in French or Spanish. 8(2-15) F. Provides the prospective teacher with an opportunity to acquire experience in the techniques and skills involved in teaching French or Spanish. Each senior student spends 10 weeks in a selected off-campus center. In addition to acquiring the competencies essential for teaching, the student teacher may become familiar with the total school program and may participate in as many school and community activities as time permits. Reynolds

ED 428 Organization of Related Study Materials. Preqs: ED 327, 344. 3(3-0) F,S. The principles of selecting and organizing both technical and general related instructional material for trade extension and industrial cooperative training classes. Smith

ED 440 Vocational Education. Preqs: ED 444, PSY 304. 2(2-0) F. Comprehensive study of vocational education of less than college grade provided for through federal legislation and an evaluation of program effectiveness. Detailed study of the North Carolina Plan. Staff

ED 444 Student Teaching in Industrial Subjects. Preqs: ED 344, PSY 304, sr. standing, admission to teacher education. 8(2-15) F. Students in vocational industrial and technical education devote 10 weeks during the fall semester to full-time, off-campus student teaching in selected public schools throughout the state. Teaching assignments are made the preceding spring so student teachers report to supervising teachers. During the term, concentrated courses will be taken. Staff

ED 450 Methods and Materials in Teaching English. Preqs: PSY 304, ED 344, sr. standing and admission to teacher education with a major in English. 3(3-0) F,S. A study of the purposes, curricula, materials and methods of teaching the skills of reading, writing, speaking and listening in secondary schools. Betts, Walters

ED 451 Teaching Secondary School Reading. Preq: Admission to teacher certification program. 2(2-0) F,S. The nature of the reading process and principles, methods and materials for the development of effective reading attitudes and skills as applied both to developmental and remedial programs. Staff

ED 454 Student Teaching in English. Preqs: ED 205, 344, PSY 304, sr. standing, admission to teacher education with a 2.1 overall average and 2.2 in English. 8(2-15) F,S. Provides the prospective teacher with experience in the techniques and skills involved in teaching English. Each student during the senior year will spend 10 weeks in a selected off-campus center. In addition to acquiring teaching competencies, the student teacher may become familiar with the total school program and may participate in as many school and community activities as time permits. Betts, Walters

ED 457 Organization and Management of Youth Club Activities. Preq: Jr. standing. 3(3-0) F. A study of the history and purposes of organized young adult activities in education. Emphasis upon organization and management of activities to prepare future teachers as competent advisers to the young adult groups in the school setting. Parker

ED 460 Methods and Materials in Teaching Social Studies. Preqs: ED 205, 344, PSY 304, sr. standing and admission to teacher education with a major in either history, sociology, politics, or economics. 4(3-1) F,S. A study of the purposes, methods, materials, curricula and evaluation practices appropriate for teachers of social studies at the seconday level. Harper

ED 464 Student Teaching in Social Studies. Preq: PSY 304, ED 344, sr. standing and admission to teacher education. 8(2-15) F,S. Provides the prospective teacher with an opportunity to acquire experience in the techniques and skills involved in teaching social studies. Each student during the senior year will spend 10 weeks in a selected off-campus center. In addition to acquiring teaching competencies, the student teacher may become familiar with the total school program and participate in as many school and community activities as time permits. Harper

ED 470 Methods of Teaching Mathematics. Preq: Admission to teacher education. 3(3-0) F,S. A study of the purposes, methods, materials, curricula and evaluation practices appropriate for teachers of mathematics at the secondary level.
Kolb, Speece, Waters, Watson

ED 471 Student Teaching in Mathematics. Preqs: ED 203, 344, PSY 304, sr. standing, admission to teacher education. Coreqs: ED 470, 472. 8(2-15) F,S. Provides the prospective teacher with an opportunity to get experience in the skills and the techniques involved in teaching mathematics. Each student during the senior year will spend 10 weeks off-campus in a selected center. In addition to acquiring teaching competencies, the student teachers may become familiar with the total school program and may participate in as many community activities as time permits. Kolb, Speece, Waters, Watson

ED 472 Developing and Selecting Teaching Materials in Mathematics. Preq: Admission to teacher education. Coreq: ED 470, 471. 2(0-6) F,S. Developing and selecting teaching material to effect new and changing concepts of the content and emphasis in high school mathematics. Course follows the class discussion and demonstration pattern. Study of latest instructional materials and devising materials and aids for increasing the effectiveness of the content and instruction.
Kolb, Speece, Waters, Watson

ED 475 Methods of Teaching Science. Preqs: ED 203, 344, PSY 304. 3(3-0) F. A study of the purposes, methods, materials, curricula and evaluation practices appropriate for teachers of physical and natural science at the secondary level.
Anderson, Shannon

ED 476 Student Teaching in Science. Preqs: ED 203, 344, PSY 304; Coreqs:sr. standing and admission to teacher education, ED 475, 477. 8(2-15) F. Provides prospective teachers with an opportunity to get experience in the skills and techniques involved in teaching science. Each student during the senior year will spend 10 weeks off campus in a selected center. In addition to acquiring competencies for teaching science, the student teacher may become familiar with the total program and may participate in as many community activities as time permits.
Anderson, Shannon

ED 477 Instructional Materials in Science. Preq: ED 203, 344, PSY 304. Coreqs: ED 475, 476, sr. standing and admission to teacher education. 2(1-3) F. Developing and selecting teaching materials in keeping with the new and changing concepts of the content and emphasis in high school science, particularly the experimental and laboratory approach. Students study the latest instructional materials and discover or devise materials and aids for increasing the effectiveness of the content and instruction. Anderson, Shannon

ED 480 Methods and Materials in Teaching Speech. Preqs: PSY 304, ED 344, sr. standing and admission to teacher education with a major in speech. 3(3-0) F,S. The purposes, curricula, materials and methods of teaching speech, including public speaking, discussion, debate, speech improvement, oral reading and play production. Munn

ED 481 Student Teaching in Speech. Preqs: ED 205, 344, PSY 304, sr. standing and admission to teacher education. 8(2-15) F,S. Provides the prospective teacher with an opportunity to acquire experience in the techniques and skills involved in teaching speech. Each student during the senior year will spend 10 weeks in a selected off-campus center. Munn

ED 482 Curriculum Problems in Industrial Arts. Preq: PSY 304 or six hours ED. 2(1-2) S. Planning and organizing learning units in industrial arts. Staff

ED 483 An Introduction to Instructional Media. Preq: Advanced undergrad. standing. 3(3-0) F,S,Sum. The characteristics and utilization of media for instruction; study and implementation of the relationship between media and instructional objectives; and elementary projects in designing, developing, and using instructional media materials. Gibson

ED 490 Senior Seminar in Agricultural Education. 1(1-0) F,S. Analysis of opportunities and problems facing educational leaders in agriculture with emphasis upon current problems. Staff

ED 495 Senior Seminar in Mathematics and Science Education. Preq: Consent of department. 3(3-0) F,S. An in-depth investigation of a teaching area in mathematics and/or science education by above-average department majors following their student teaching. Staff

ED 496 Senior Seminar in Education. Preq: CI. 1-3 F,S,Sum. An in-depth investigation and discussion of a topic or set of problems in professional education. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ED 500 The Community College System. Preq: Grad. or advanced undergrad. standing. 3(3-0) F. Comprehensive community colleges and technical institutes and the state systems of which they are a part; underlying concepts, education needs they serve, role in meeting these needs, historical development, issues in the establishment and operation of state systems and individual institutions, unresolved issues and emerging trends. Graduate Staff

ED (SOC) 501 Leadership. 3(3-0) F,S. (See sociology, page 363.)

ED (PS) 502 Public Administration. 3(3-0) F,S. (See politics, page 345.)

ED 503 The Programming Process in Adult and Community College Education. Preqs: ED 501, CI. 3(3-0) F,S. Principles and processes involved in programming, including basic theories and supporting concepts. Attention to the general framework in which programming is done, the organization needed and the program roles of professional and lay leaders. Graduate Staff

ED 504 Principles and Practices of Introduction to Vocations. Preqs: Twelve hours ED. 3(3-0) F,S. Designed for North Carolina public school teachers of Introduction to Vocations. Emphasizes the place of the Introduction to Vocations Program in the overall school curriculum, special methods of instruction, use of teaching aids and use of student evaluation instruments. An overview in com-

munity organization, job markets, group procedures, occupational and educational information, and the changing occupational structure in our society. Graduate Staff

ED 505 Public Area Schools. Preq: Grad. status. 3(3-0) F,Sum. Junior and community colleges, technical institutes, vocational schools and branches of universities: their development, status and prospects; policy and policy making, clientele, purposes, evaluation programs, personnel, organization administration, financing, facilities, research and development functions. Graduate Staff

ED 506 Education of Exceptional Children. Preqs: Six hours ED or PSY. 3(3-0) F,S,Sum. Principles and techniques of teaching the exceptional child, especially the mentally handicapped and slow learner. Practice in curriculum instruction for groups of children, and individual techniques for dealing with retarded children in the average classroom. Opportunity for individual work with an exceptional child. McCutchen

ED 507 Analysis of Reading Abilities. Preqs: Six hours ED or PSY. 3(3-0) F, Sum. A study of tests and techniques in determining specific abilities; a study of reading retardation and factors underlying reading difficulties. Rust

ED 508 Improvement of Reading Abilities. Preqs: Six hours ED or PSY 3(3-0) S,Sum. Methods used in developing specific reading skills or in overcoming certain reading difficulties; methods used in developing pupil vocabularies and word analysis skills. How to control vocabulary burden of reading material. Rust

ED 509 Methods and Materials-Teaching Retarded Children. Preq: ED 506. 3(3-0) F,S,Sum. Emphasis on understanding and correlating developmental levels of mentally retarded children and appropriate educational methods and materials. Use of individual child's diagnostic data; consideration of long and short range education scheduling; teacher guidance of children toward social and emotional maturity. McCutchen

ED 510 Adult Education: History, Philosophy, Contemporary Nature. Preq: Grad. standing. 3(3-0) F. The historical and philosophical foundations of adult education from ancient times to the present: key figures, issues, institutions, movements and programs, the relationship between adult education's historical development and prevailing intellectual, social, economic and political conditions. Consideration of adult education's contemporary nature, present-day schools of thought on its objectives and trends. Graduate Staff

ED 511 Implications of Mathematical Content, Structure, and Processes for the Teaching of Mathematics in the Elementary School. Preq: Bachelor's degree in elementary education, or CI. 3(3-0) F,S. Designed for teachers and supervisors of mathematics in the elementary school. Emphasis on implications of mathematical content, structure, and processes in teaching arithmetic and geometry in the elementary school. Attention to use of logic and fundamental rules of inference, deductive and inductive reasoning, the field properties in the sets of integers and rational numbers, elementary number theory, metric and non-metric geometry. Watson

ED 512 Active Learning Approaches to Teaching Mathematics in the Elementary School. Preq: Bachelor's degree in elementary education or CI. 3(3-0) S. Emphasis on the laboratory approach to teaching mathematics and the use of the manipulative materials and activities of the Nuffield Project, the Madison Project, Dienes, Cuisenaire, and Gattegno. Attention to research supporting the laboratory approach using manipulative materials in the elementary school. Suggestions for designing activities for independent and group study and in assessing individual progress. Watson

ED (SOC) 513 Community Organization. 3(3-0) F. (See sociology, page 364.)

ED 516 Community Occupational Surveys. Preq: Six hours ED, CI. 2(2-0) S. Methods in organizing and conducting local surveys and evaluation of findings in planning a program of vocational education. Graduate Staff

ED 517 Implications for Data Processing in Education. Preqs: CSC 111, ED 529 or CI. 3(3-0) F,S. Current attempts to apply new technologies to education. Attention to research findings related to Computer Assisted Instruction, gamed instructional simulation, approaches to guidance and prescription learning. Administrative problems pertaining to student scheduling, pupil transportation and data reporting systems. Graduate Staff

ED 518 Principles of School Law. Preq: Six hours graduate credit. 3(3-0) F,S. Intensive study of legal rights, duties, privileges and responsibilities entailed in the educational enterprise. Covers the essentials of school law for both 1) the processes of law as they affect American education and 2) specific legal aspects which affect vocational education. Included are the secondary, post-secondary and adult vocational education laws and their implications. Graduate Staff

ED 519 Early Childhood Education. Preq: PSY 475 or 576. 3(1-4) S,Sum. The plannings, selection and utilization of human resources, activities, materials and facilities relating to the education of young children. Emphasis on student observation, participation and evaluation of educational experiences appropriate for the developmental level of individual children, including flexible grouping, curricula planning and instructional techniques for an optimum learning environment. A synthesis of the student's knowledge of human development, learning theory and research findings as related to classroom application. McCutchen

ED 520 Personnel and Guidance Services. Preqs: Six hours in ED or PSY. 3(3-0) F,S. The philosophies, theories, principles and practices of personnel and guidance services; the relationship of personnel services with the purposes and objectives of the school and the curriculum. Graduate Staff

ED 521 Internship in Guidance and Personnel Services. Preqs: Eighteen hours in department and CI. Credits Arranged. F,S. A continuous full-time internship of at least one-half semester. Framework of school and community. Work with students, teachers, administrators, guidance and pupil personnel workers, parents, and resource personnel in the community. Supervision of intern by school guidance personnel and course instructors. Graduate Staff

ED 522 Career Exploration. Preqs: ED 344 and grad. status or CI. 3(3-0) F,S, Sum. Designed for North Carolina public school teachers in career exploration programs. Emphasizes the philosophy, theories and the place of career exploration programs in the overall school curriculum. Correlation of occupational information in academic subjects, sources of occupational information and its use, and approaches to teaching. Scarborough, Cox

ED 523 Orientation and Mobility of the Visually Impaired. 3(3-0) Sum. The sensory processes and cues on which independent mobility depends for the visually impaired person. Various techniques and modes of travel considered. Emphasis on instruction and background which will enable persons not teaching orientation mobility as a skill to reinforce the learning that takes place in other situations. Graduate Staff

ED 524 Occupational Information. Preqs: Six hours ED or PSY, ED 520 or equivalent. 3(3-0) S. Gives teachers, counselors, placement workers and personnel workers in business and industry an understanding of how to collect, classify, evaluate and use occupational and educational information. Includes a study of the

world of work, sources of occupational information, establishing an educational-occupational information library, using educational, occupational and social information and sociological and psychological factors, influencing career planning.
Graduate Staff

ED 525 Trade Analysis and Course Construction. Preq: ED 344, PSY 304. 3(3-0) F. Principles and practices in analyzing occupations to determine teaching content. Practice in the principles underlying industrial course organization based on occupational analysis covering instruction in skills and technology and including course outlines, job sequences, the development of industrial materials and instructional schedules. Graduate Staff

ED 526 Teaching in College. 3(3-0) F,S,Sum. Designed for graduate students not in Education. Focuses on developing competencies to perform the day-to-day tasks of a college teacher, long-range tasks such as course development and the university responsibilities of a professor. Students will make video tapes of their teaching, develop tests, design an introductory course in teaching field, and engage in other similar types of activities. Anderson

ED 527 Philosophy of Occupational Education. Preq: Grad. standing. 3(3-0) F,S. An historical and philosophical investigation of social and economic aspects of occupational education. An overview vocational education for youth and adults emphasizing trends and problems connected with the conduct of occupational education under federal and state guidance. Study of federal and state legislation pertaining to vocational education. Graduate Staff

ED 528 Cooperative Occupational Education. Preq: CI. 3(3-0) F,S. Designed for individuals preparing to be directors, administrators or supervisors of vocational education programs at the local, state and/or national levels. Emphasis on organization and operation of cooperative occupational programs. Covers the entire field of cooperative occupational education on secondary, post-secondary and adult levels with references to accepted essentials of cooperative education so details of planning, organization, establishment, and operation of cooperative occupational programs will be practical and meaningful. Student visitations to existing quality programs in cooperative occupational education to study on-site conditions in specialized areas. Smith

ED 529 Curriculum Materials Development. Preq: ED 525. 3(3-0) S. Selection and organization of curricula used in vocational-industrial and technical education; development of curricula and instructional materials. Hanson

ED 530 Group Guidance. Preqs: Six hours ED or PSY, ED 520 or equivalent. 3(3-0) F. Designed to help teachers, counselors, administrators and others who work with groups, or who are responsible for group guidance activities, to understand the theory and principles of effective group work, to develop skill in using specific guidance techniques, and to plan and organize group activities in the secondary school and other institutions. Graduate Staff

ED (PSY) 531 Mental Deficiency. Preqs: Nine hours PSY and special education. 3(3-0) S,Sum. Description, causation, psychological factors and sociological aspects of mental retardation. Education methods for the mentally retarded. Course designed primarily for school psychologists and special-class teachers of retarded children, both educable and trainable. Corter

ED 533 Organization and Administration of Guidance Services. Preqs: Grad. standing, ED 520 or equivalent. 3(3-0) S. Designed for school guidance counselors, prospective counselors, personnel and guidance directors, and school administrators. The philosophy and scope of guidance and personnel services; the functions and

responsibilities of personnel involved; basic principles and current practices in planning, developing, operating and supervising guidance and personnel services.
Graduate Staff

ED 534 Guidance in the Elementary School. Preq: Nine hours PSY or CI. 3(3-0) S. Designed for acquainting elementary school teachers, counselors and administrators with theory, practice and organization of elementary school guidance.
Graduate Staff

ED 535 Student Personnel Work in Higher Education. Preqs: Nine hours PSY or CI. 3(3-0) F,S. Examines practices in various areas of student personnel work. Studies both structure and function of personnel programs in higher education.
Graduate Staff

ED 536 Structure and Function of the Eye and Use of Low Vision. Preq: CI. 3(5-0) Sum. In this special institute participants spend a minimum of 45 hours in class and related activities. Medical and educational consultants discuss the structure and function of the eye, eye anomalies likely to affect children with low vision, methods of evaluating type and potential use of residual vision, and methods of teaching children to use minimal vision effectively. Course for teachers and administrators either presently employed in or planning to participate in educational programs for low vision persons.
Rawls

ED 537 The Extension and Public Service Function in Higher Education. Preq: ED 510. 3(3-0) S. The background, history, philosophy and contemporary nature of the extension and public service function of institutions of higher education in the United States. Emphasis on the adult education role of public and private universities and colleges. Specific focus on: general, industrial, engineering, and cooperative extension and continuing education.
Graduate Staff

ED 538 Instructional Strategies in Adult and Community College Education. Preq: ED 559, grad. standing. 3(3-0) S. Forms of instruction appropriate for the teaching of adults. Emphasis on methods which maximally involve the adult learner. The study of concepts, theories, and principles relevant to the selection, utilization, and evaulation of instructional strategies focuses on integration of theory into practice. Classroom exercises, using teaching techniques applicable in adult and community college education.
Graduate Staff

ED 540 Individual and Group Appraisal I. Preqs: ED 520, PSY 353, or equivalent. 3(3-0) F. Use of group tests of intelligence, interest and achievement in educational and career planning and placement. Theories of intelligence and interest will be followed by laboratory in evaluating, administering and interpreting widely used group test. Emphasis on group test use in group guidance.
Graduate Staff

ED 542 Contemporary Approaches in the Teaching of Social Studies. Preq: Advanced undergrad. or grad. must have completed student teaching. 3(3-0) Sum. Analysis of principles, strategies and applications of new teaching approaches. Team-teaching, programmed instruction, inductive and reflective oriented teaching, role-playing, simulation and gaming, independent study and block-time organization.
Harper

ED 550 Principles of Educational Administration. Preq: Grad. standing, CI. 3(3-0) F,S,Sum. Introductory course in educational administration, emphasizing basic principles. Draws upon administrative theory, business, and public administration models as well as theoretical constructs from various disciplines.
Graduate Staff

ED 552 Industrial Arts in the Elementary School. Preq: Twelve hours ED, CI. 3(3-0) Sum. To help elementary teachers and principals understand how tools,

materials and industrial processes vitalize and supplement the child's experiences. Practical children's projects along with the building of classroom equipment.
Graduate Staff

ED 554 Planning Programs in Agricultural Education. Preq: ED 411 or equivalent. 3(3-0) F,S. Consideration of the need for planning programs in education; objectives and evaluation of community programs; use of advisory group; organization and use of facilities in agricultural education. Bryant

ED 555 Comparative Crafts and Industries. Preqs: Advanced undergrad. or grad. standing, CI. 6 Sum. A travel seminar as a cultural appreciations course involving study of indigenous crafts and industries, their materials, processes, products and design in foreign countries. Graduate Staff

ED 559 Learning Concepts and Theories Applied to Adult and Community College Education. Preq: Six hours ED. 3(3-0) S. Principles in adult education programs including theories and concepts undergirding and requisite to these programs. Emphasis on interrelationship of the nature of adult learning, the nature of the subject matter and the setting in which learning occurs. The applicability of relevant principles and pertinent research findings to adult learning.
Graduate Staff

ED (IA) 560 New Developments in Industrial Arts Education. 3(3-0) F,S. (See industrial arts, page 289.)

ED 563 Effective Teaching. Preqs: Twelve hours ED including student teaching. 3(3-0) F,S,Sum. Analysis of the teaching-learning process; assumptions that underlie course approaches; identifying problems of importance; problem solution for effective learning; evaluation of teaching and learning; making specific plans for effective teaching. Graduate Staff

ED 565 Agricultural Occupations. Preq: ED 411. 3(3-0) F,S. Career development in agricultural occupations is associated with curriculum development needs. Occupational experience in agriculture is seen in relation to curriculum and placement. Miller

ED 566 Occupational Experience in Agriculture. Preq: ED 411. 3(3-0) F,S. Implementing new and expanded concepts of occupational experience including how to effect student learning experiences in a real and simulated employment environment. Study of theoretical foundations underlying the new developments in occupational experiences to stimulate individual growth and creativity in implementing further developments. Miller

ED 568 Adult Education in Agriculture. Preq: ED 411 or equivalent. 3(3-0) F,S. Designed for leaders in adult education. Basic problems and values in working with adult groups. Attention to the problem of fitting the education program for adults into the public school program and other educational programs as well as methods of teaching adults. Graduate Staff

ED 570 Foundations of Mathematics Education. Preqs: ED 471 or equivalent. 3(3-0) Assumptions and justifications underlying prevailing practices in secondary mathematics teaching are identified and examined within the broader context of mathematics education. Judging pedagogical techniques and curricular innovations is based upon a historical overview of the field, psychological considerations relating to mathematics learning, comparison in national and international mathematics education, and research evidence. Graduate Staff

ED 590 Individual Problems in Guidance. Preq: Six hours graduate work in department or equivalent and CI. Maximum 6 F,S. Intended for individual or group

studies of problems in guidance and personnel work. Problems selected to meet individuals' interests. The workshop procedure will be used whereby special projects, reports, and research will be developed by individuals and by groups.
Graduate Staff

ED 591 Special Problems in Industrial Education. Preqs: Six hours graduate credit, consent of department head. Maximum 6. Directed study to provide individualized study and analysis in specialized areas of trade, industrial or technical subjects. Graduate Staff

ED 592 Special Problems in Mathematics Teaching. Preq: ED 471 or equivalent. 3(3-0) F,S. Investigation of current problems in mathematics teaching, emphasizing curriculum, methodology, facilities, supervision and research. Specific problems will be studied in depth. Opportunities to initiate research studies.

ED 593 Special Problems in Agricultural Education. Preq: ED 411 or equivalent. Credits Arranged. Study of current problems under staff guidance.
Graduate Staff

ED 594 Special Problems in Science Teaching. Preq: ED 476 or equivalent. 3(0-3) F,S. Investigation of current problems with emphasis on curriculum, methodology, facilities, supervision and research. Specific problems will be studied in depth. Opportunities to initiate research studies. Graduate Staff

ED (IA) 595 Industrial Arts Workshop. Preq: One or more years of teaching experience. 3(3-0) Sum. A course for experienced teachers, administrators and supervisors of industrial arts. Primarily to develop sound principles and practices for initiating, conducting, and evaluating programs. Enrollees will pool their knowledge and practical experiences and do intensive research on individual and group programs. Graduate Staff

ED 596 Topical Problems in Adult and Community College Education. Preq: Grad. standing. Credits Arranged. Study and scientific analysis of problems in adult education, and preparation of a scholarly research type of paper. Graduate Staff

ED 597 Special Problems in Education. Preqs: Grad. standing and CI. 1-3 F,S, Sum. Provides graduate students in education the opportunity to study problem areas in professional education under the direction of graduate faculty.
Graduate Staff

ED 598 Concepts and Strategies of Understanding, Motivating and Teaching Disadvantaged Adults. Preqs: Grad. standing. 3(3-0) S. Designed to help adult educators acquire comprehensive understanding of the educational, psychological, social, cultural, and economic problems of the culturally deprived. In-depth explorations of the theoretical basis for understanding, motivating and teaching disadvantaged adults will be interwoven with practical applications to specific educational opportunities with the disadvantaged adult learner. Graduate Staff

FOR GRADUATES ONLY

ED 600 Organizational Concepts and Theories Applied to Adult and Community College Education. 3(3-0) F.

ED 601 Administrative Concepts and Theories Applied to Adult and Community College Education. 3(3-0) S.

ED 602 Curriculum. 3(3-0) F,S.

ED 603 Teaching Mathematics and Science in Higher Education. 3(3-0) F.

ED 604 Curriculum Development and Evaluation in Science and Mathematics. 3(3-0) F,S.

ED 605 Education and Supervision of Teachers of Mathematics and Science. 3(3-0) S.

ED 608 Supervision of Vocational and Industrial Arts Education. 3(3-0) F.

ED 609 Planning and Organizing Technical Education Programs. 3(3-0) S.

ED 610 Administration of Vocational and Industrial Arts Education. 3(3-0) S.

ED 611 Laws, Regulations and Policies Affecting Vocational Education. 3(3-0) F,S.

ED 612 Finance, Accounting and Management of Vocational Education Programs. 3(3-0) F,S.

ED 614 Formative Ideas in American Education. 3(3-0) F,S,Sum.

ED 615 Introduction to Educational Research. 3(3-0) F.

ED 620 Cases in Educational Administration. 3(3-0) S,Sum.

ED 621 Internship in Education. 3-9 F,S,Sum.

ED 630 Philosophy of Industrial Arts. 2(2-0) F,S.

ED 631 Vocational Development Theory. 3(3-0) F.

ED 633 Techniques of Counseling. 3(3-0) S.

ED 635 Administration and Supervision of Industrial Arts. 2(2-0) F,S.

ED 636 Observation and Supervised Field Work. Maximum 3 F,S.

ED 640 Individual and Group Appraisal II. 3(3-0) F.

ED 641 Laboratory and Practicum Experiences in Counseling. 2-6, F,S.

ED (IA) 660 Industrial Arts Curriculum. 3(3-0) F,S,Sum.

ED 664 Supervision in Agricultural Education. 3(3-0) F,S.

ED 665 Supervising Student Teaching. 3(3-0) F,S,Sum.

ED 666 Supervision of Counseling. 3(1-8) F,S.

ED 688 Research Application in Occupational Education. 3(3-0) F,S,Sum.

ED 689 Evaluation in Occupational Education. 3(3-0) F,S,Sum.

ED 690 Seminar in Mathematics Education. Maximum 2 F,S,.

ED 691 Seminar in Industrial Education. 1(1-1) F,S.

ED 692 Seminar in Industrial Arts Education. 1(1-0) F,S.

ED 693 Advanced Problems in Agricultural Education. Credits Arranged. F,S, Sum.

ED 694 Seminar in Agricultural Education. Maximum 2 1(1-0) F,S,Sum.

ED 695 Seminar in Science Education. Maximum 2. F,S,Sum.

ED 696 Seminar in Adult and Community College Education. 1-3 F,S.

ED (PSY) 697 Advanced Seminar in Research Design. 3(3-0) F,S.

ED 698 Seminar in Occupational Education. 3(3-0) F.

ED 699 Research. Credits Arranged.

Electrical Engineering

FOR UNDERGRADUATES

EE 201 Electric Circuits I. Preq: MA 102. 4(2-5) F,S. Fundamental laws, transient and steady-state sinusoidal analysis. Problem drill and laboratory exercises.

EE 202 Electric Circuits II. Preq: EE 201, MA 201. 4(2-5) S. Circuit analysis by complex frequency. Two-part networks and polyphase circuits. Problem drill and laboratory exercises.

EE 211 Electric Circuits I. Theory, Preq: MA 102. 3(3-0). Theory part of EE 201. Offered only by correspondence. Enrollment subject to approval of EE undergraduate administrator.

EE 213 Electric Circuits I. Laboratory, Preq: EE 211. 1(0-2) Sum. Laboratory part of EE 201. Enrollment subject to approval of EE undergraduate administrator and limited to students who have passed EE 211.

EE 303 Electromagnetic Fields I. Preqs: EE 201, PY 208, Coreq: MA 301. 3(2-3) F. Field theory in vector analysis formulation emphasizing static and quasi-static electric and magnetic fields. Maxwell's equations.

EE 304 Electromagnetic Fields II. Preq: EE 303, MA 301. 3(2-3) S. Vector and scalar retarded potentials. Generation and propagation of energy by electromagnetic waves. Relationship between field theory and circuit theory. Applications of electromagnetic theory to devices and to distributed parameter systems.

EE 305 Electromechanical Systems. Preqs: EE 202, MA 202, EE 303. 4(3-3). Principles, performance and characteristics of direct-current and alternating-current machinery.

EE 314 Electronic Circuits. Preqs: EE 202, MA 202. 4(2-5) F. Active devices with emphasis on bipolar and field effect transistors as elements of electric circuits. Elementary physical electronics, linear and nonlinear equivalent circuits, small signal amplifiers.

EE 331 Principles of Electrical Engineering. Preqs: MA 201, PY 208. 3(3-0) F,S. Not available to EE undergraduates. Basic concepts, units and methods of EE analysis. Current-voltage characteristics of linear and nonlinear electrical devices, analysis of d-c and a-c circuits, simple amplifiers and energy conversion devices. Demonstrations of equipment and procedures.

EE 332 Principles of Electrical Engineering. Preq: EE 331. 3(3-0) S. Not available to EE undergraduates. Power distribution systems, motors, feedback, ampli-

fiers, oscilloscopes, voltage meters, digital information, measurement by digital means, presented from the user's viewpoint. Demonstrations of equipment and procedures.

EE 333 Principles of Electrical Engineering Laboratory. Coreq: EE 332. 1(0-3) S. Not open to EE students. Laboratory work in the material covered in EE 332.

EE 339 Principles of Electrical Engineering Laboratory. Coreq: EE 331. 1(0-3) F,S. Not open to EE students. Laboratory work in the material covered in EE 331.

EE 350 Electric Power Utilization in Manufacturing Processes. Preqs: PY 212, MA 201. 3(2-3) F,S. Not available to undergraduates in EE. Basic electrical theory; d-c and a-c circuits and measurements; study of d-c motors and of single-phase and polyphase utilization equipment; basic control systems and brief introduction to principles of automatic control. Examples drawn from the technologies of particular interest to current students.

FOR ADVANCED UNDERGRADUATES

EE 401 Advanced Electric Circuits. Preq: EE 202, MA 301. 3(3-0) F,S. Transient analysis by the Laplace transform method, and its relationship to steady-state performance, with emphasis on feedback systems.

EE 403 Electric Network Design. Preq: EE 401. 3(3-0) S. Design methods for such electric networks as resonant systems, filters, feedback stabilizers, audio amplifier compensation and dividing networks.

EE 406 Dynamical Systems Analysis. Preqs: EE 202 or 331, ESM 305, MA 301. 3(3-0) F. Dynamic systems in various branches of engineering and science emphasizing similarities among such integrated groups of devices. Analogous elements and quantites in these fields as determined from basic equations. Use of computers to solve system problems.

EE 431 Electronics Engineering. Preq: EE 314. 3(2-3) F. Design and analysis of discrete and integrated solid-state electronic circuits which include amplifiers, waveform generators, and feedback. Design is emphasized through projects and through analysis of contemporary electronic circuits.

EE 432 Communication Engineering. Preq: EE 431. 3(2-3) S. Application of Electronic Circuits to Communication systems employing sine wave and pulse modulation. Elements of complete systems (modulators, demodulators, transmitters and receivers) are designed, analyzed and implemented.

EE 433 Electric Power Engineering. Preq: EE 305 or 332. 3(2-3) S. Electric power supply for industrial and commercial applications. Control of electric motor drives. Principles of circuit protection and safety. Laboratory experience in testing electric machines.

EE 434 Power System Analysis. Preq: EE 305. 3(3-0) F. Problems encountered in the long-distance transmission of electric power with emphasis on load flow, economic dispatch, and fault calculations. Applications of digital computers to power-system problems.

EE 435 Elements of Control. Preqs: EE 314, 305. 3(2-3) F. Introductory theory of open- and closed - loop control. Dynamic analysis of error detectors, amplifiers, and motors. Component transfer characteristics and block diagram representation. Analog simulation of a control system.

EE 438 Electronic Instrumentation. Preqs: MA 301; EE 314 or 332. 3(3-0) S. Electrical-electronic measurement techniques and operating principles of electronic instruments. Signal sources and their equivalent circuits, basic electronics including junction and field effect transistors, operational amplifiers, switching logic and data display. Applications including low-level phenomena and noise problems. Lecture demonstrations.

EE 440 Fundamentals of Digital Systems. Preq: EE 314. 3(3-0) F,S. Basic concepts in digital solutions to problems. Mathematical considerations (number systems, codes, and Boolean algebra), circuit considerations, digital subsystems (combinational circuits, sequential circuits, storage, and AD/DA conversion), basic system organization.

EE 441 Introduction to Electron Devices. Preqs: MA 301, PY 208. 3(3-0) F. The basic physical principles necessary for understanding modern electronic devices. Quantum and statistical mechanic concepts are introduced forming the basis for a discussion of a wide variety of devices used in modern engineering and instrumentation.

EE 442 Introduction to Solid-State Devices. Preqs: EE 441 or PY 407; MA 301. 3(3-0) S. The microscopic phenomena responsible for the operation of solid-state electronic devices. A qualitative description of the band model of solids. A description of the transport properties of charge carriers. P-n junction diodes and transistors, solar cells, controlled rectifiers, tunnel diodes and unijunction transistors, recently developed devices.

EE 445 Introduction to Antennas. Preqs: EE 304, 314. 3(2-3) F. Consideration of radiation from single-element radiators, radiation patterns, directive properties aperture concepts, gain and impedances. Multielement antennas and arrays with various amplitude distributions and phasings, and thin linear antennas. Antennas of current usage.

EE 448 Introduction to Microwaves. Preqs: EE 304, 314. 3(2-3) S. The elementary theory and special techniques required at microwave frequencies. Passive and active circuits. Transmission elements, special-purpose components, generators, to include klystrons, magnetrons, traveling wave tubes, and solid-state devices will be discussed. The description of microwave networks by the scattering matrix.

EE 492 Special Topics in Electrical Engineering. Preq: Jr. standing. 3(3-0 to 0-9) F,S. Offered as needed to cover new or special subjects.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

EE 503 Computer-Aided Circuit Analysis. Preqs: EE 314, 401, B average in EE and MA. 3(3-0) F. Analysis of electrical circuits with emphasis on computer methods. Steady-state and transient analysis of linear and nonlinear networks; tolerance analysis; programming considerations. Staudhammer

EE 504 Introduction to Network Synthesis. Preqs: EE 401, B average in EE and MA. 3(3-0) S. The properties of network functions and the development of the methods of network synthesis of one-port and two-port passive structures.

EE 511 Electronic Circuits. Preqs: EE 314 or 430, B average in EE and MA. 3(3-0) F. Electronic devices and circuits in communications, power and industrial applications. Synthesis of circuits to satisfy system requirements. Barclay

EE 512 Communication Theory. Preqs: EE 314, B average in EE and MA. 3(3-0) F. Basic information-bearing signals in linear systems. Signals in the frequency and time domains, probability and associated functions, random signal theory,

modulation and frequency translation, noise, sampling theory and correlation functions. Principles of information theory including information measure, signal space and channel capacity. Fundamentals of encoding. Accent on methods and problems unique to digital communication. (Offered F every year and S 1975).
Barclay, Goetze, O'Neal, Stroh

EE 516 Feedback Control Systems. Preqs: EE 435, or 401 and B average in EE and MA. 3(3-0) S. The feedback systems for automatic control of physical quantities such as voltage, speed and mechanical position. Theory of regulating systems and servo mechanisms. Steady-state and transient responses. Evaluation of stability. Transfer function loci and root locus plots. Analysis using differential equation and operational methods. Systems compensation and introduction to design.
Peterson

EE 517 Control Laboratory. Coreq: EE 516. 1(0-3) S. Feedback systems for automatic control of physical quantities such as voltage, speed and mechanical position. Characteristics of regulating systems and servomechanisms. The laboratory work contributes to understanding theory developed in EE 516.
Peterson

EE 520 Fundamentals of Logic Systems. Preqs: EE 314, 440, B average in EE and MA. 3(3-0) F. Elementary machine language theory, computer organization and logic design, logical algebras and function minimization (map method emphasized). Introductory combinational and sequential logic including circuits, basic building blocks, and theory construction using electronic and core elements. (Offered F every year, Sum. 1975 and S 1976.) Bell, Gault, Staudhammer

EE 521 Digital Computer Technology and Design. Preq: EE 520. 3(3-0) S. The internal organization and structure of digital systems including gates, toggle circuits, pulse circuitry and advanced machine language theory. Analysis and synthesis of major computer components, including the logic section, storage devices, registers, input-output and control. Bell, Staudhammer

EE 530 Physical Electronics. Preqs: EE 304, B average in EE and MA. 3(3-0) F. The behavior of charged particles under the influence of fields and other charged particles. Ballistics, quantum mechanics, particle statistics, electron emission and properties of dielectric and magnetic materials. (Offered F every year, S 1975).
Matthews

EE 533 Integrated Circuits. Preqs: EE 314, B average in EE and MA. 3(3-0) S. The implementation of solid-state circuits in integrated form. Includes characteristics of expitaxial, diffused, thin and thick film approaches. Digital and linear applications. Manning

EE (MAE) 535 Gas Lasers. 3(3-0) F,S. (See mechanical and aerospace engineering, page 312.)

EE 540 Electromagnetic Fields and Waves. Preqs: EE 304, B average in EE and MA. 3(3-0) F. Laws and concepts of static electromagnetism. Fundamental equations and their applications. Fundamentals, forms and applications of Maxwell's equations. Vector and scalar potentials, relativistic aspects of fields, energy and power. Waves in unbound and bounded regions, radiation, wave-guides and resonators. (Offered F every year, Sum. 1975.) Tischer

EE 545 Introduction to Radio Wave Propagation. Preqs: EE 304, B average in EE and MA. 3(3-0) S. Characteristics of a plan e electromagnetic waves in homogeneous and nonhomogeneous media with application to tropospheric and ionospheric propagation. Relationships between electron density, collision frequency

and complex refractive index, theory of the formation and dynamics of ionospheric layers and theorems for the prediction of ionospheric propagation. Flood

EE 591, 592 Special Topics in Electrical Engineering. Preq: B average in technical subjects. 3(3-0) F,S. A two-semester sequence to develop new courses and explore areas of special interest. Graduate Staff

EE 593 Individual Topics in Electrical Engineering. Preq: B average in technical subjects. 1-3 F,S. The student explores topics of special interest under faculty direction.

FOR GRADUATES ONLY

EE 610 Non-Linear Analysis. 3(3-0) F.

EE 611 Digital Filtering. 3(3-0) F,S.

EE 613, 614 Advanced Feedback Control. 3(3-0) F,S.

EE 616 Microwave Electronics. 3(3-0) S.

EE 617 Pulse and Digital Circuits. 3(3-0) S.

EE 618 Antennas and Radiation. 3(3-0) F.

EE 619 Applied Electromagnetic Fields and Waves. 3(3-0) S.

EE 622 Electronic Properties of Solid-State Materials I. 3(3-0) S.

EE 623 Electronic Properties of Solid-State Materials II. 3(3-0) F.

EE 624 Electronic Properties of Solid-State Devices. 3(3-0) S.

EE 625 Advanced Solid-State Device Theory. 3(3-0) S.

EE 640 Advanced Logic Circuits. 3(3-0) S.

EE 641 Sequential Machines. 3(3-0) F.

EE 642 Automata and Adaptive Systems. 3(3-0) S.

EE 651 Statistical Communication Theory. 3(3-0) S.

EE 652 Information Theory. 3(3-0) F.

EE 653 Fundamentals of Space Communications. 3(3-0) S.

EE 654 Communication Systems Analysis. 3(3-0) S.

EE 655 Wave Phenomena in Plasma. 3(3-0) S.

EE 659 Pattern Recognition. 3(3-0) F.

EE 691, 692 Special Studies in Electrical Engineering. 3(3-0) F,S.

EE 695 Electrical Engineering Seminar. 1(1-0) F,S.

EE 699 Electrical Engineering Research. Credits Arranged.

Engineering

GENERAL COURSES

E 101 Engineering Graphics I. 2(1-2) F,S. Graphically representing and solving spatial problems. Emphasis on development of a logical and analytic approach to problem solution. Conventional methods of graphically describing size and shape, the representation of basic mechanical elements. Practical engineering applications utilized. Staff

E 120 Engineering Concepts. Not open to jrs. and srs. in Engineering. 3(2-1) F,S. Students are involved in realistic freshman design projects. History, fields and functions of engineering, case studies, computational skills, and societal problems are covered. Staff

E 201 Spatial Relations and Vector Applications. Preqs: First courses in graphics and physics. 3(2-2) F,S. Spatial representation of points, lines, and planes and the determination of the lengths, sizes, and angles that exist between these elements, with the application of these studies to vector systems. Staff

E 207 Engineering Graphics II. Preq: E 101. 2(1-3). Presentation of engineering data for use in the manufacturing process. Production dimensioning, detail and assembly production drawings, and free-hand sketching are covered. Special emphasis on sketching. Webb

E 220 Engineering and Contemporary Society. 3(3-0) F. Investigation of the role of engineering technology in modern life, with emphasis on technological factors involved in solution of national and world problems. Major topics such as energy, communication, materials, and transportation examined in terms of cultural and economic goals for the future.

E 240 Furniture Graphics. Preq: E 101. 3(1-4) F. Furniture drawing and dimensioning. Special practices of furniture industry are covered. Free-hand sketching is emphasized. Freeman

E 301 Graphical Solutions for Numerical Data. Preq: A first course in calculus. 3(2-2) F. Study of available graphic methods to represent and manipulate numerical data. Topics include: proper selection of coordinate systems and axes, empirical equations, curve fitting, graphical calculus, nomography, and design of special purpose slide rules. Computer applications demonstrated. Hammond

E (CSC) 321 Computer Graphics. Preqs: MA 202 or 212 and CSC 101 or 111. 3(2-2) S. Presentation of computer-graphic methods of data manipulation; which computer-graphic methods are available; when and how they can be applied. Three-dimensional applications covered. Houck

E 432 Patents, Trademarks and Copyrights. Preq: Jr. standing. 3(3-0) S. Review of these laws in relation to engineering, scientific and industrial pursuits; individual inventors, authors, and companies; and Patent Office procedures and practices. Mills

E 492 Special Topics in Engineering. Preq: Jr. standing. 1-3 F,S. Offered as needed for subject matter of a non-departmental nature. Staff

Engineering Honors

EH 346 Fluid Mechanics. Preq: ESM 200 or 205; membership in Eng. HP or CI.* 3(3-0) S. Equilibrium of liquids and gases, kinematics and dynamics of frictionless fluids. Motion of viscous fluids. Dynamics of gases. Flow measurement techniques.

* Eng. HP or CI—engineering honors program or consent of instructor.

EH 371 Thermodynamics I. Preq: Membership in Eng. HP or CI.* 3(3-0) F. Basic principles and concepts. Emphasis on first and second laws, their implications and applications. Properties of actual and real gases. Also inter-relationships between the properties as given by the general equations of thermodynamics.

EH 372 Thermodynamics II. Preq: Membership in Eng. HP or CI.* 3(3-0) S. Statistical approach to thermodynamics and application to determination of specific heats. Entrophy and probability. Thermodynamics of fluid flow including supersonic flow. Basic laws of heat transfer. Ideal gas and vapor cycles. Introduction to chemical thermodynamics.

EH 391 Contemporary Trends in Engineering and Science. Preq: Membership in Eng. HP or CI.* 1(1-0) F. Representatives from various fields of engineering or science discuss current topics.

EH 491 Engineering Honors Seminar. Preq: Sr. standing in the Eng. HP or CI.* 1(1-0) S. Presentation by students of their projects.

EH 496 Special Topics in Engineering. Preq: Membership in the Eng. HP or CI.* 1-4 F,S. Individual projects of a research or design nature.

EH 500 Engineering Analysis. 1-4 F,S. Students work in small groups or individually with faculty advisers to solve realistic problems requiring integration of knowledge from engineering fields, physical sciences, mathematics, and occasionally life sciences. Aimed at synthesis rather than mere analysis.

Engineering Operations

EO 491 Seminar in Engineering Operations. Preq: Sr. standing. 1(1-0) F. Assists seniors in EO make the transition from a college environment to that of industry through lectures, guest speakers and class discussions. Schedule during the last fall semester in residence. Easter

Engineering Science and Mechanics

FOR UNDERGRADUATES

ESM 200 Introduction to Mechanics. Coreq: MA 202. 3(3-0) F,S. Principles and concepts which form the basis for studies in dynamics, solid and fluid mechanics. The nature and properties of force systems and stress fields. The motion of particles and description of deformation of continuous media. The role of Newton's laws, the concepts of continuity and equilibrium, and the conservational principles in problems in mechanics. Staff

ESM 205 Principles of Engineering Mechanics. Preq: PY 205; Coreq: MA 202. 3(3-0) F,S. Basic concepts, forces and equilibrium, distributed forces, virtual work, and inertial properties; application to machines, structures and systems. Staff

ESM 206 Introductory Applications in Mechanics. Coreq: ESM 205. 1(0-2) F. Principles of mechanics applied to practical problems of engineering science in which numerical techniques of computation are emphasized. Staff

ESM 211 Introduction to Applied Mechanics. Coreq: MA 212, PY 212. 3(3-0) F,S. The concepts of particle and rigid body mechanics. The fundamentals of equilibrium,

* Eng. HP or CI—engineering honors program or consent of instructor.

kinematics and kinetics are applied to engineering problems involving structures and machines. Staff

ESM 212 Mechanics of Engineering Materials. Preq: ESM 211. 3(2-1) F,S. A study of the properties of engineering materials emphasizing the mechanical parameters pertinent to the selection and specification of materials common to engineering practice. Emphasis on mechanical design parameters. Staff

ESM 301 Mechanics of Solids. Preq: ESM 200. 3(3-0) F,S. For CE students. Development of the equations which describe the linear elastic solid. Approximate solutions and comparison with the theory of elasticity to problems involving axial, torsional and flexural loading. Staff

ESM 303 Fluid Mechanics I. Preq: ESM 200 or 205. 3(3-0) F,S. Development of the basic equations of fluid mechanics in general and specialized form. Application to a variety of topics including 1) fluid statics, 2) inviscid, incompressible fluid flow and 3) viscous, incompressible fluid flow. Staff

ESM 304 Fluid Mechanics II. Preq: ESM 303. 3(3-0) F,S. Further applications of the basic equations of fluid mechanics to 1) boundary layers and analysis, 2) laminar and turbulent flows and 3) compressible fluid flow. Introduction to experimental methods in fluid mechanics. Staff

ESM 305 Engineering Dynamics. Preq: ESM 205; Coreq: MA 301. 3(3-0) F,S. Equations of motion; kinematics, kinetics of mass points and systems of mass points; kinematics and kinetics of rigid bodies; dynamics of nonrigid systems. Staff

ESM 307 Solid Mechanics I. Preq: ESM 205; Coreq: MA 301. 3(3-0) F,S. Stresses, strains, constitutive laws, yield and fracture; application to axial, bending, torsional and plane stress states; deflection and stability analyses. Staff

ESM 308 Solid Mechanics II. Preq: ESM 301 or 307. 3(3-0) F,S. Equations for thin plates. Introduction to the theory of plasticity and experimental methods in solid mechanics. Plastic stress-strain relationships and two-dimensional problems in plastic behavior, and fracture. Staff

ESM 311 Experimental Engineering Science I. Coreqs: ESM 303, 305, 307. 3(1-6) F. The experimental analysis concept starting with the question of how observations and measurements are made. Illustrations of experimental methods which enable the inference of one physical variable by the observation of another but related one. Bingham, Sorrell

ESM 312 Experimental Engineering Science II. Preq: ESM 311. 3(1-6) S. The ESM 311 background is utilized in broader problems which require the synthesis from several experimental methods as well as mathematical and/or numerical methods of an analytical system. Bingham, Sorrell

ESM (ARC) 315 Architectural Mechanics I. Preq: One semester of calculus; Recommended: PY 221 or equivalent. 3(2-3) F. The determinants of architectural form are related to structural function through a study of mechanics; principles of particle and rigid body statical mechanics; equilibrium of external and internal force systems. Lect.—concepts and methods; workshops—application and exploration of lecture material. Gurley, Brantly

ESM (ARC) 316 Architectural Mechanics II. Preq: ESM (ARC) 315. 3(2-3) S. The mechanical properties of construction materials and the purpose, geometrical

characteristics, behavior, and design of structural elements are investigated in some lecture-workshop format. Gurley, Brantly

ESM 411, 412 Engineering Cybernetics I, II. Preq: Sr. standing in ESM or equivalent background. 3(1-4) F,S. A year course of formal lectures on topics which include dynamics of linear and nonlinear systems; hereditary and feedback couplings; continuous, discrete, random and stochastic inputs; system stability; reliability; optimization; and the ultra-stable autonomous system. Student participation, in either individual or collective form, in extra-class work of personal character in the design of particular engineering systems. Eckerlin, McDonald

ESM 415 Engineering Science in Contemporary Design. Preq: Sr. standing in ESM. 2(1-3) S. Draws upon student's background in engineering sciences to analyze current problems. Case histories and evaluations of selected designs.
Bingham, Douglas

ESM 495 Special Studies in Mechanics. 1-3 F,S. Offered as needed to treat new or special subject matter. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ESM 501, 502 Continuum Mechanics I, II. Preqs: ESM 307, ESM 303, MAE 301, MA 405. 3(3-0) F,S. The concepts of stress and strain are presented in generalized tensor form. Emphasis on the discussion and relative comparison of the analytical models for elastic, plastic, fluid, viscoelastic, granular and porous media. Underlying thermodynamic principles presented, the associated boundary value problems formulated and selected examples used to illustrate the theory. T. S. Chang

ESM 503 Theory of Elasticity I. Preq: ESM 307; Coreq: MA 511 or 401. 3(3-0) F. The fundamental equations governing the behavior of an elastic solid are developed in various curvilinear coordinate systems. Plane problems, as well as the St. Venant problem of bending, torsion and extension of bars are covered. Displacement fields, stress fields, Airy and complex stress functions are among the methods used to obtain solutions. Gurley, Smith

ESM 504 Mechanics of Ideal Fluids. Preq: ESM 304; Coreq: MA 513. 3(3-0) F. Basic equations of ideal fluid flow; potential and stream functions; vortex dynamics; body forces due to flow fields, methods of singularities in two-dimensional flows; analytical determination of potential functions; conformal transformations; free-streamline flows. Edwards, Sorrell

ESM 505 Mechanics of Viscous Fluids I. Preq: ESM 304; Coreq: MA 532. 3(3-0) S. Equations of motion of a viscous fluid (Navier-Stokes equations); general properties of the Navier-Stokes equations; some exact solutions of the Navier-Stokes equations; boundary layer equations; some approximate methods of solution of the boundary layer equations; laminar boundary layers in axisymetric and three-dimensional flows; unsteady laminar boundary layers. Edwards, Sorrell

ESM 506 Mechanics of Compressible Fluids I. Preqs: ESM 304, MAE 302; Coreq: MA 532. 3(3-0) F. Introduction to the flow of a compressible fluid: thermodynamics and one-dimensional energy equation for a compressible gas. Acoustics, normal shock waves and expansion waves, shock tube theory, general one-dimensional flow and flow in ducts and channels. Sorrell

ESM 507 Systems Analysis. Preqs: ESM 305, MA 405. 3(3-0) F. The principles and concepts underlying systems analysis. Major topics are: finite-dimensional vector spaces, matrices and linear operators, state space and state equations, linear differential systems, and equilibrium and stability. Illustrations and applications

from the broad areas of engineering mechanics and dynamical systems theory. The state variable approach is emphasized. Eckerlin, McDonald

ESM 508 Systems Synthesis. Preq: ESM 507. 3(3-0) S. The design of engineering systems in which mechanics dominates. Eckerlin, McDonald

ESM 509 Space Mechanics I. Preq: ESM 305. Coreq: MA 511. 3(3-0) F. The applications of mechanics to the analysis and design of orbits and trajectories. Trajectory computation and optimization; space maneuvers; reentry trajectories; interplanetary guidance. Clayton, Maday

ESM 510 Space Mechanics II. Preq: ESM 509, MA 511. 3(3-0) S. The analysis and design of guidance systems. Basic sensing devices; the characteristics of an inertial space; the theory of stabilized platforms; terrestrial inertial guidance. Clayton, Maday

ESM 511 Theory of Plates and Shells. Preqs: ESM 307, MA 511. 3(3-0) F. Bending theory of thin plates; geometry of surfaces and stresses in shells. Methods of analysis discussed and illustrated. Bingham, Clayton, Gurley

ESM 521, 522 Properties of Solids I, II. Preqs: ESM 307, MAT 301, PY 413. 3(3-0) F,S. Micro and macro principles are applied toward an introductory understanding of material properties. The concepts of kinetic distribution and ensemble average of atomic behaviors are employed to characterize and interrelate material properties. Phenomenological behaviors and coupled effects are described within the continuum concept. Horie

ESM 551 Advanced Strength of Materials. Preq: ESM 307. 3(3-0) F. Stresses and strains at a point; rosette analysis; stress theories, stress concentration and fatigue; plasticity; inelastic composite and curved beams; prestress energy methods; shear deflections; buckling problems and column design; and membrane stresses in shells. Gurley

ESM 552 Elastic Stability. Preqs: ESM 551, MA 301, MA 405. 3(3-0) S. Elastic and plastic stability. The stability criterion as a determinant. The energy method and the theorem of stationary potential energy. The solution of buckling problems by finite differences and the calculus of variations. The application of successive approximations to stability problems. Optimization applied to problems of aeroelastic and civil engineering structures. Gurley

ESM 555 Dynamics I. Preqs: ESM 305, MA 405. 3(3-0) F. The theory of vibrations from the Lagrangian formulation of the equations of motion. Free and forced vibrations with and without damping, multiple degrees of freedom, coupled motion, normal mode vibrations, wave propagations in solid bodies. Clayton, Maday

ESM 556 Dynamics II. Preq: ESM 305, MA 405. 3(3-0) S. The dynamics of particles and rigid bodies by the use of formulations of the laws of mechanics due to Newton, Euler, Lagrange and Hamilton. Accelerated reference frames, constraints, Euler's angles, the spinning top, the gyroscope, precession, stability, phase space and nonlinear oscillatory motion. Clayton, Maday

FOR GRADUATES ONLY

ESM 601, 602 Unifying Concepts In Mechanics I, II. 3(3-0) F,S.

ESM 603 Theory Of Elasticity II. 3(3-0) S.

ESM 604 Theory Of Plasticity. 3(3-0) S.

ESM (MAS, OY) 605, 606 Advanced Geophysical Fluid Mechanics I, II. 3(3-0) F,S.

ESM 611 Mechanics Of Compressible Fluids II. 3(3-0) S.

ESM 612 Mechanics Of Viscous Fluids II. 3(3-0) F.

ESM (MAS, OY) 613, 614 Perturbation Method In Fluid Mechanics I, II. 3(3-0) F,S.

ESM (OR) 631 Variational Methods In Optimization Techniques I. 3(3-0) F.

ESM (OR) 632 Variational Methods In Optimization Techniques II. 3(3-0) S.

ESM 641 Optical Mechanics. 3(2-3) F.

ESM 656 Nonlinear Vibrations. 3(3-0) S.

ESM 695 Experimental Methods In Mechanics. 3(2-3) S.

ESM 697 Seminars In Mechanics. 1(1-0) F,S.

ESM 698 Special Topics In Mechanics. Credits Arranged F,S.

ESM 699 Research In Mechanics. Credits Arranged F,S.

English

FRESHMAN ENGLISH
Required of all Freshmen

ENG 111 Composition and Rhetoric. 3(3-0) F,S. Basic forms and principles of expository communication; conferences. Staff

ENG 112 Composition and Reading. Preq: ENG 111. 3(3-0) F,S. Expository writing; introduction to literary types; collateral reading; conferences. Staff

NOTE: ENG 111 and 112 must be scheduled in successive semesters until they are completed satisfactorily.

NOTE: Qualified students will be allowed to register for ENG 112H and will be given credit for ENG 111 upon successful completion of the course. Eligibility for ENG 112H is based on the student's predicted grade in English, employing a formula determined by Counseling, plus a composition to be written at the first or second class meeting of the ENG 112H section.

NOTE: The prerequisite for all advanced courses in writing, language, or literature is the completion of ENG 111 and 112. Desirable preparation for literature courses of the 300 level or above is ENG 205, 206, 207, 208, or any semester of ENG 261, 262 or ENG 265, 266.

WRITING

FOR UNDERGRADUATES

ENG 200 Writing Laboratory. 0(0-3) F,S. A remedial course in composition designed for upperclassmen, chiefly juniors and seniors, in any curriculum.
Easley

ENG 215 Principles of News and Article Writing. 3(3-0) F,S. Introduction to the techniques of conducting interviews and writing news stories (including feature articles) for a variety of news media. Bolch

ENG 298 Special Projects in English. 1-3 F,S. Staff

ENG 315 Reporting and Editing. Preq: ENG 215. 3(3-0) S. A journalism course in techniques of analyzing sources and readership; planning, organizing, and writing various kinds of articles; and editorial processes such as copyediting, headline writing, and page layout. Bolch

ENG 321 The Communication of Technical Information. 3(3-0) F,S. Intensive training in the fundamentals of business and industrial expository and persuasive writing. Blackman, Dandridge, Spears

ENG 322 Advanced Expository Writing. 3(3-0) F. Examines the rhetoric of the sentence, the paragraph and the whole discourse in order to develop awareness of the relationship between structure and effect in expository writing. Section 322H is restricted to Teacher Certification English majors. Dandridge, Meyers, Short

ENG 323 Creative Writing. 3(3-0), Maximum 6 F,S. For students who have demonstrated ability. Emphasis on short prose fiction. Students may register in this course for a maximum of six hours. Barrax, Jeffers, Owen, Walters

LITERATURE

FOR UNDERGRADUATES

ENG 205 Studies in Great Works of Literature.* 3(3-0) F,S. Literary masterpieces from the Classical Period to the present. Emphasis on reading for understanding and enjoyment both of the works themselves and the cultural contributions to Western civilization of the periods from which the works are drawn. Staff

ENG 206 Studies In Drama.* 3(3-0) F,S. Selected drama from the Classical Period to the present. Emphasis on reading for enjoyment as well as understanding theory and development of tragedy, comedy, and other modes of dramatic expression. Staff

ENG 207 Studies In Poetry.* 3(3-0) F,S. Analysis of poetry and the critical approaches to it. Emphasis on appreciation of the nature of poetry, and understanding features and techniques. The importance of both historical context and new critical techniques. Staff

ENG 208 Studies In Fiction.* 3(3-0) F,S. Representative examples from the Renaissance to the present, emphasizing understanding and appreciation of fiction as a genre, a knowledge of the features and techniques of fiction, and a sense of the historical development of this genre. Staff

ENG 261 English Literature I. 3(3-0) F,S. Beginnings to 1660. Staff

ENG 262 English Literature II. 3(3-0) F,S. 1660 to present. Staff

ENG 265 American Literature I. 3(3-0) F,S. Beginnings to 1850. Staff

ENG 266 American Literature II. 3(3-0) F,S. 1850 to present. Staff

* The courses ENG 205, 206, 207 and 208 are designed for students not enrolled in Liberal Arts.

ENG 290 Classical Backgrounds of English Literature. 3(3-0) F. Acquaints student with the central story-matter of the ancient world—Greek, Roman, and Hebrew—which has exerted such a profound influence on the civilization, and especially on the literature, of the Western world. Lasseter, Moore

ENG (REL) 325 Religion and the Modern Literary Imagination. 3(3-0) F. (See religion, page 360.)

ENG 346 Literature of the Western World I. 3(3-0) F,S. The Search for Self: Readings from the earliest Hebraic and Greek literature to Dante. Smoot, Smith

ENG 347 Literature of the Western World II. 3(3-0) S. Crisis and Confrontation: Readings from the European Renaissance to Tolstoi. Smoot

ENG 369 American Novel of the 19th Century. 3(3-0) F. Analysis of selected romantic, realistic, and naturalistic novels. Clark, Kilby and West

ENG 370 The British Novel of the 18th and 19th Centuries. 3(3-0) F. Background of the English novel from its beginnings to the end of the 19th century. Analysis of the novel as a form. Moore, Durant

ENG 371 The Modern Novel. 3(3-0) S. Background and pattern, and an analysis of major examples of the 20th-century novel. Moore, Halperen, Reynolds

ENG 372 Modern Poetry. 3(3-0) S. Defining the "modern temper" by comparison of contemporary poetry with that of the past. Reading and analysis of individual poems. Jeffers, Owen, Reynolds

ENG 375 The Film: A Literary Medium. Preq: Jr. standing. 3(3-0). Hargrave

ENG 391 Introduction to American Folklore. 3(3-0) S. Principal types of folklore, combined with field work in collecting and assimilating materials from various cultural traditions. Emphasis on American folklore and its origins. Betts, Owen

ENG 395 Black American Literature. 3(3-0) F,S. A survey from significant beginnings to the present. Lucas, Barrax and Jeffers

ENG 397 Literature of the Non-Western World. 3(3-0) F. Translations from the literature of Persia, India, China, and Japan. Lasseter, Owen

ENG 398 Contemporary Literature I (1900 to 1940). 3(3-0) F. Imaginative literature from the period 1900-1940 with emphasis upon themes and techniques rather than genre or nationality. Knowles, Reynolds

ENG 399 Contemporary Literature II (1940 to present). 3(3-0) S. Representative French, American, and British writers of the period 1940 to the present. Knowles, Reynolds

ENG 439 17th-Century English Literature. 3(3-0) S. Major nondramatic literary figures in England during the period 1600-1700. Moore, White

ENG 449 The Renaissance. 3(3-0) F. Nondramatic prose and poetry of the 16th century, with consideration of literary types and movements. Emphasis on the works of major authors. Blank, Hester

ENG 451 Chaucer. 3(3-0) F,S. Introduction to the study of Chaucer through an intensive reading of *The Canterbury Tales* and *Troilus and Criseyde*. Koonce, Short, Toole

ENG 453 The Romantic Period. 3(3-0) F. The poetry of Wordsworth, Coleridge, Byron, Shelley, and Keats, with readings in the prose of Lamb, DeQuincey, and others. P. Williams, Hargrave

ENG 462 18th-Century English Literature. 3(3-0) F. The major figures in English literature between 1660 and 1790 in the light of social, cultural, and religious change. Durant, White

ENG 463 The Victorian Period. 3(3-0) S. Major poets and selected prose writers studied against the social, economic, scientific, and theological background of the century. Hargrave, Lasseter

ENG 468 American Romanticism. 3(3-0) F. Major American writers from 1825 to 1865. Clark, Stein, West

ENG 469 American Realism and Naturalism. 3(3-0) S. Major American writers from 1865 to 1935. Clark, Stein, West

ENG 480 Modern Drama. 3(3-0) F. Major plays from Ibsen to Albee.
Halperen

ENG 485 Shakespeare. 3(3-0) F,S. Principal plays with emphasis on the development of the playwright. Blank, Hester, Wall, P. Williams, M. C. Williams

ENG 496 Literary Analysis (Senior Seminar). Preq: Consent of department. 3(3-0) F,S. Flexible course in reading and criticism designed to synthesize aspects of student's work in literature to provide a capstone for undergraduate program.
Staff

ENG 498 Special Topics in English. Preq: Six hours ENG above the fr. level. 1-6 F,S. Detailed investigation of a topic in language or literature. Topic and mode of study determined by faculty member in consultation with English department head. Staff

FOR ADVANCED UNDERGRADUATES AND GRADUATES

ENG 504 Problems in College Composition. Preq: Appointment as a graduate teaching assistant in English. 0(0-0) F. Directed study of the development of rhetorical skills in composition in classroom situations. Smith

ENG 524 Modern English Usage. Preq: CI or grad. standing. 3(3-0) S. English grammar, with attention to new developments in structural linguistics and with emphasis on current usage. Meyers, Short

ENG 526 History of the English Language. Preq: CI or grad. standing. 3(3-0) S. Growth and development of the language from its Indo-European beginnings to the present. Offered in alternate years. A section designated 526H, restricted to Teacher Certification English majors, will be offered every semester.
Meyers, Short

ENG 561 Milton. Preq: ENG 261 or equivalent. 3(3-0) S. Intensive reading of Milton with attention to background materials in the history and culture of 17th-century England. Moore, White

ENG 575 Southern Writers. Preq: ENG 266 or equivalent. 3(3-0) S. Contribution of the South to American literature, with intensive study of selected major figures.
Lucas, MacKethan, West

ENG 578 English Drama to 1642. Preq: ENG 261 or equivalent. 3(3-0) F. English drama from its liturgical beginnings to the closing of the theatres, excluding Shakespeare. Champion, Meyers, M. C. Williams

ENG 579 English Drama of the Restoration and Eighteenth Century. Preq: ENG 261 or equivalent. 3(3-0) S. English drama from 1660 to 1800. Durant, Moore

ENG 590 Literary Criticism. Preq: ENG 261 or equivalent. 3(3-0) S. The critical process as it leads to the definition and analysis of literature, together with attention to the main literary traditions and conventions. Durant, P. Williams

FOR GRADUATES ONLY

ENG 609 Old English Literature. 3(3-0) F. (Offered in alt. years.)

ENG 610 Middle English Literature. 3(3-0) F. (Offered in alt. years.)

ENG 615 American Literature of the Colonial Period. 3(3-0) F. (Offered in alt. years.)

ENG 620 16th-Century Non-Dramatic English Literature. 3(3-0) F.

ENG 630 17th-Century English Literature. 3(3-0) S.

ENG 650 19th-Century English Literature: The Romantic Period. 3(3-0) F.

ENG 651 Studies in Chaucer. 3(3-0) F.

ENG 655 19th-Century American Literature: The Romantic Period. 3(3-0) F.

ENG 658 Studies in Shakespeare: The Tragedies. 3(3-0) F.

ENG 659 Studies in Shakespeare: The Comedies. 3(3-0) S.

ENG 660 Victorian Poetry. 3(3-0) S. (Offered in alt. years.)

ENG 661 Victorian Prose. 3(3-0) S. (Offered in alt. years.)

ENG 662 18th-Century English Literature. 3(3-0) F.

ENG 665 19th-Century American Literature: Realism and Naturalism. 3(3-0) S.

ENG 670 20th-Century British Prose. 3(3-0) S. (Offered in alt. years.)

ENG 671 20th-Century British Poetry. 3(3-0) S. (Offered in alt. years.)

ENG 675 20th-Century American Prose. 3(3-0) F. (Offered in alt. years.)

ENG 676 20th-Century American Poetry. 3(3-0) F. (Offered in alt. years.)

ENG 680 20th-Century British Drama. 3(3-0) S. (Offered in alt. years.)

ENG 681 20th-Century American Drama. 3(3-0) S. (Offered in alt. years.)

ENG 692 Special Topics in American Literature. 3(3-0) F,S.

ENG 693 Special Topics in English Literature. 3(3-0) F,S.

ENG 698 Bibliography and Methodology. 3(3-0) F,S.

ENG 699 Research in Literature (Thesis). Credits Arranged F,S.

Entomology

FOR UNDERGRADUATES

ENT 201 Insects and Man. 2(2-0) F. The ways in which insects affect our lives today and how man deals with them, how they have altered the course of history, and how we may learn from them in studying their ability to adapt to their changing environments. The aesthetic and avocational aspects of insects. Intended for students not in biological sciences. Moore

ENT 301 Introduction to Forest Insects. Preq: FOR 264. 3(2-2) F. Covers the fundamentals of classification, development, habits and control of forest insects. Farrier

ENT 312 Introduction to Economic Insects. 3(2-2) F,S. The fundamentals of insect classification, development, food habits and controls. Brett, Moore

FOR ADVANCED UNDERGRADUATES

ENT (ZO) 401 Bibliographic Research in Biology. 1(1-0) F. A general course dealing with the literature problems of the biological scientist and how they may be solved. (Offered F 1976 and alt. years.) Farrier

ENT (BS) 410 Biology of Insects. Preq: ZO 201 or 202. 3(2-2) F. Brings together current knowledge concerning major functional, behavioral, and adaptive characteristics of insects and stresses the underlying biological principles. Yamamoto

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ENT 502 Insect Diversity. Preq: Twelve hours of biology. 4(2-4) F. The external morphology of insects and a survey of the biology and identification of immature and adult insects. Evolutionary relationships of insects and other arthropods, speciation, insect zoogeography, nomenclature, and classical and recent approaches to systematics considered. Baker, Neunzig, Young

ENT 503 Functional Systems of Insects. Preq: Twelve hours of biology, nine hours of chemistry, three hours of biochemistry, ENT 310 or equivalent. 4(2-6) S. The morphology, histology and function of the organ systems of insects. Sensory and general physiology lead into basic elements of insect orientation and behavior. Campbell, Hodgson, Yamamoto

ENT 504 Insect Morphology. Preq: ENT 502. 3(1-4) F. External morphology, primary and comparative phases, with emphasis on knowledge and techniques which can be applied to specific problems. (Offered F 1975 and alt. years.) Young

ENT 511 Systematic Entomology. Preq: ENT 301 or 312. 3(1-4) F. A detailed survey of the orders and families of adult insects, to acquaint the student with those groups and develop ability in the use of the taxonomic literature. (Offered F 1976 and alt. years.) Young

ENT 520 Insect Pathology. Preqs: Introductory entomology and introductory microbiology. 3(2-3) S. A treatment of the noninfectious and infectious diseases of insects, the etiological agents and infectious processes involved, immunological responses and applications. (Offered S 1975 and alt. years.) Brooks

ENT 531 Insect Ecology. Preq: ENT 502. 3(2-2) F. The environmental relations of insects, including insect development, habits, distribution and abundance. (Offered F 1975 and alt. years.) Rabb, Stinner

ENT 541 Immature Insects. Preq: ENT 502 or equivalent. 2(1-3) F. An advanced study of the immature stages of selected orders of insects with emphasis on generic and specific taxa. Primary consideration of the larval stage, but a brief treatment of eggs and pupae. (Offered F 1976 and alt. years.) Neunzig

ENT 542 Acarology. Preq: ENT 301 or 312 or ZO 201. 3(2-3) S. A systematic survey of the mites and ticks with emphasis on identification, biology and control of the more common and economic forms attacking material, plants and animals including man. (Offered S 1975 and alt. years.) Farrier

ENT 550 Fundamentals of Insect Control. Preq: ENT 312 or 301. 3(2-2) F. The principles underlying modern methods for protecting food, clothing, shelter and health from insect attack. Guthrie

ENT 562 Agricultural Entomology. Preq: ENT 301 or 312. 3(2-3) S. The taxonomy, biology and ecology of beneficial and injurious insects and mites of agricultural crops. Advantages and limitations of the advanced concepts for controlling insect and mite populations on different crops. (Offered S 1975 and alt. years.) Bradley, Rock

ENT (PHY, ZO) 575 Physiology of Invertebrates. 3(3-0) F. (See zoology, page 389.)

ENT (ZO) 582 Medical and Veterinary Entomology. Preqs: ENT 301 or 312 and ZO 315 or equivalent. 3(2-3) S. The morphology, taxonomy, biology and control of the arthropod parasites and disease vectors of man and animals. The ecology and behavior of vectors in relation to disease transmission and control. (Offered S 1976 and alt. years.) Axtell

ENT 590 Special Problems. Preq: CI. Credits Arranged F,S. Original research on special problems in entomology not related to a thesis problem. Provides experience and training in research. Graduate Staff

FOR GRADUATES ONLY

ENT 602 Principles of Taxonomy. 3(1-4) S.

ENT 611 Biochemistry of Insects. 3(3-0) F.

ENT 622 Insect Toxicology. 3(2-3) S.

ENT 690 Seminar. 1(1-0) F,S.

ENT 699 Research. Credits Arranged F,S.

Food Science

FOR UNDERGRADUATES

FS 201 Food Science and Technology. 3(2-3) F. The sciences involved in food processing. The role of foods and the food industry in the development of man. The relationships between production, processing and consumption. Principles and methods of food preservation. Laboratories and field trips to typical processing operations and representative food industries. Warren

FS (ANS, NTR) 301 Nutrition and Man. 3(3-0) F,S. (See animal science, page 200.)

FS (BAE) 331 Food Engineering. Preq: PY 211 or 221. 3(2-3) F. Engineering concepts application to the food industry. Principles of thermodynamics, fluid flow, heat transfer, refrigeration and electricity. Jones, Willits

FS 400 Foods and Nutrition. Preq: CH 220. 3(3-0) S. The health of an individual as related to food and the ability of his body to use food. Evaluation of normal diets and factors that promote optimal nutrition throughout life, and the application of biochemistry to utilization of foods. Aurand

FS 402 Food Chemistry. Preq: CH 220 or 221. 3(3-0) F. Introduction to the biochemistry of foods emphasizing basic composition, structure, properties and nutritive value. The chemistry of changes occurring during processing and utilization of foods. Giddings

FS (PO) 404 Poultry Products. Preq: CH 220 or 221. 3(2-3) F. The composition, quality, processing and preservation of poultry meat and eggs. Ball

FS (MB) 405 Food Microbiology. Preq: MB 301 or 401. 3(2-3) F. The micro organisms of importance in foods, and their cultural and metabolic activities. The physical and chemical destruction of microorganisms in foods and kinetics involved. The conversion of raw foods by microorganisms into altered foods, and the nutrition, growth and preservation of the culture involved. Foods as vectors of human pathogens. The evolution of microbiological standards for foods.
Speck, Adams

FS (ANS) 409 Meat and Meat Products. Preq: CH 220. 3(2-3) S. The basic principles involved in processing beef, pork and lamb from the live animal to the various representative cured, fresh, canned and comminuted meat items currently produced. Blumer

FS (BAE) 432 Food Engineering II. Preq: FS (BAE) 331. 3(2-3) S. The theory and principles of evaporation, drying and distillation with emphasis on applications in food processing. Instrumentation and control systems used in the food industry.
Jones

FS 490 Food Science Seminar. Preq: Sr. standing. 1(1-0) S. A review and discussion of scientific articles, new developments and topics of current interest.
Roberts, Warren

FS 491 Special Topics in Food Science. Preq: Sr. standing or CI. 1-6 F,S. Topics are selected or assigned. Study of current topics and/or problems to gain additional knowledge and interpretative experience in a specific area. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

FS 503 Food Analysis. Preqs: CH 315, BCH 351, FS 402. 3(1-6) S. The principles, methods and techniques necessary for quantitative physical and chemical analyses of food and food products. Results of analyses studied and evaluated in terms of quality standards and governing regulations. Johnson

FS 504 Advanced Food Chemistry. Preq: BCH 551. 3(3-0) S. The molecular properties of food components, their interactions and reactions and the physicochemical alterations occurring in the maturation, harvest, process and storage stages. Aurand

FS (MB) 506 Advanced Food Microbiology. Preq: FS 405 or equivalent. 3(1-6) S. The interactions of microorganisms in foods and their roles in food spoilage and bioprocessing. Cellular and molecular relationships in bacterial injury, repair and aging resulting from environmental stresses. Bacterial sporulations, germination, and physiological properties of bacterial spores. Gilliland

FS 511 Food Research and Development. Preqs: FS 331, 402, 405. 3(2-3) S. The scientific principles underlying the development of new and improved food products and processes. Emphasis on the application of research and development principles to meat, poultry, and fisheries industries. Webb

FS 516 Quality Control of Food Products. Preqs: FS 331, 402, 405. 3(2-3) S. Quality control fundamentals in the food industry including specifications and standards, testing procedures, sampling, statistical and quality control and organization. Food products and industry problems used in the presentation with emphasis on dairy products. Hansen

FS (HS) 521 Food Preservation. Preqs: MB 401 or FS 405, FS 402 or BO 421. 3(2-3) F. Principles and methods in food preservation. Emphasis on thermal, freezing, drying and fermentation processes and their relationship to physical, chemical and organoleptic changes in product. The relationship of these preservation techniques to the development of an overall processing operation. Carroll

FS (HS) 562 Post-Harvest Physiology. 3(3-0) S. (See horticultural science, page 287.)

FS (BAE) 585 Biorheology. 3(2-2) S. (See biological and agricultural engineering, page 209.)

FS 591 Special Problems in Food Science. Preq: Grad. or sr. standing. 1-6 F,S. Analysis of scientific, engineering and economic problems of current interest. The scientific appraisal and solution of a selected problem. Problems designed to provide training and experiences in research. Graduate Staff

FOR GRADUATES ONLY

FS 601 Theory of Physical Measurements of Biopolymers. 3(2-3) S.

FS 690 Seminar in Food Science. 1(1-0) F,S.

FS 691 Special Research Problems in Food Science. Credits Arranged F,S.

FS 699 Research in Food Science. Credits Arranged F,S.

Forestry

FOR UNDERGRADUATES

FOR (WPS) 101 Introduction to Forest Resources. 1(1-0) F. Professions related to forest resources; their scope and opportunities. Conservation of natural resources. Staff

FOR 204 Silviculture. Sophomore summer camp. Preq: Jr. standing in FOR. 2(0-6) Sum. Field exercises to enable the student to describe and measure factors of the forest environment, the ecology of forest communities, tree structure and growth, and tree and stand response to treatments which are normal parts of forest management operations. Duffield

FOR 210 Dendrology-Gymnosperms. Preq: BO 200. 2(1-2) S. Identification, relationships and distribution of gymnosperm trees, emphasizing characteristics of genera and higher taxonomic groups. Duffield

FOR 211 Dendrology-Angiosperms. Preq: BO 200. 2(1-2) F. Identification, relationships and distribution of angiosperm trees, emphasizing characteristics of genera and higher taxonomic groups. Preston

FOR (WPS) 219 Forest Economy and its Operation. Preq: EC 212 or 201. 3(2-2) F. Multiple use concept of forestry; economic principles underlying production; investment problems; factors which influence demand for forest products. Steensen

FOR 263 Dendrology. Sophomore summer camp. Preqs: FOR 210, 211. 1(0-3) Sum. Identification of trees, shrubs and woody vines of the Piedmont and mountain regions of North Carolina, principally by bark, foliage, flowers and developing fruits. Duffield, Perry

FOR 264 Forest Protection. Sophomore summer camp. Preq: Jr. standing in FOR. 2(0-6) Sum. Identification and control of forest insects and diseases. Behavior of fire and the meteorological factors affecting it. Suppression of a large simulated fire, including use of modern ground equipment, aircraft and communications systems. Staff

FOR 272 Forest Mensuration. 3(2-2) S. Scientific basis for the measurements and estimates required in forest resources management and goods and services derived from forest land. Includes theory of measurements, the required procedures, instrumentation and statistical prerequisites, with emphasis on sampling problems. Steensen

FOR (WPS) 273 Quantitative Methods in Forest Resources. Preq: Soph. standing. 3(2-2) F,S. Problem solving techniques in forestry, wood technology, pulp and paper technology and recreation resources. Historical development of past techniques, assessment of present technology, and an evaluation of problem solving tools, including an introduction to computers. Gemmer

FOR 274 Mapping and Mensuration. Sophomore summer camp. Preq: FOR 272. 4(0-12) Sum. Use of surveying instruments and graphic methods in preparation of topographic and planimetric maps of forested areas. Measurement of height, diameter, bole form and age of trees. Study of stand density, growing stock levels and financial maturity. Stem analysis sampling and site index determinations. Jervis, Steensen

FOR 284 Utilization. Sophomore summer camp. Preq: Jr. standing in FOR. 1(0-3) Sum. Inspection of wood industries; expositions on manufacturing processes. Staff

FOR (PP) 318 Forest Pathology. 4(3-2) S. (See plant pathology, page 341.)

FOR 353 Air Photo Interpretation. Preq: Jr. standing. 3(2-3) S. Theory, principles and techniques of utilizing air photos as data sources for planning and management of renewable resources. Particular attention to stereoscopic identification and examination of the bioecological factors of terrain, plants, growing conditions, water, wildlife and the changes brought about by man's activities. Lammi

FOR 405 Forest Land Management. Preqs: FOR 272, 452. 5(2-6-2) F. Management of forest lands for multiple benefits. Principles and techniques in regulating regeneration, species composition, growth and quality of woody vegetation; use of

planting, seeding, cutting, herbicides and fire in vegetation management. Application of financial principles to decisions regarding investments in forest management. Bryant, Duffield

FOR 406 Forest Land Inventory and Planning. Preq: FOR 405. 6(2-12) S. Applications of land management systems, including silviculture, protection, utilization and related problems in evaluation of assigned forest areas. Students complete a resource inventory and submit individual plans for management of the assigned tract. Bryant

FOR (WPS) 423 Logging and Milling. 3(2-3) F. (See wood and paper science, page 385.)

FOR (WPS) 435 Systems Analysis in Forest Products. 3(3-0) S. (See wood and paper science, page 385.)

FOR 452 Silvics. Preqs: BO 200, CH 103, PY 221 or 212, mathematics through calculus. 4(3-2) S. Forest production can be increased by manipulating the physical environment, the genotype, and plant competition. The theoretical bases for these manipulations in applied ecology. Perry

FOR 462 Artificial Forestation. 2(1-2) S. Biology of seed production by forest trees; forest tree seed collection, extraction, storage and testing; biology of tree seedling growth; soil aspects of nursery management; forest nursery operation; soil aspects of site preparation, planting and direct seeding; reforestation operations. (Offered S 1974 and alt. years.) Duffield, Davey

FOR 472 Renewable Resource Management. Preqs: A basic course in biology and economics; jr. or sr. standing. 3(3-0) S. Concepts and problems of coordinated use and management of renewable resources—soil, water, vegetation and fauna. Man as a biological factor interacting with other components of terrestrial ecological systems, particularly forests and related communities. Consideration of interrelationships of forests, water, range-land, wildlife and outdoor recreation and their aesthetic and economic values. Inventory and management techniques and economic policies relating to renewable resources. (Not open to FOR majors.) Preston

FOR 491 Senior Problems in Forestry. Preq: Consent of department. Credits Arranged. Faculty-approved problems in management or technology. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

FOR 501 Forest Influences and Watershed Management. Preq: Advanced undergrad. or grad. standing. 3(3-0) F. The effects of vegetation on climate, water and soil, with applications of forest influences to management of forest land resources, including conservation and yield of water, stabilization of streamflow and soils, reduction of sedimentation and general improvement of the environment. Maki

FOR 512 Forest Economics. Preq: Basic course in economics. 3(3-0) S. The setting and functioning of the forest economy. Topics include: Supply and demand of industrial forest products and timber raw material; competition and pricing in the forest industries; competitive advantage of major forest regions; optimum rotation decision and financial returns to forest management; problems of timber production on non-industrial woodlands; economic analysis of non-timber forest products. Holley

FOR 571 Advanced Forest Mensuration. Preqs: FOR 272, ST 311. 3(2-2) S. The development of mathematical models to describe forest resources phenomena; cri-

teria for evaluating the "goodness" of such models; and methods of data collection for use in the evaluation. Hafley

FOR 572 Conservation Policy Issues. Preq: Advanced undergrad. or grad. standing. 3(3-0) S. Analysis of attitudes of selected private groups and public agencies toward multiple resource development. Attention to trends in development of forest resource policies, timber management objectives, private industry activity in forest development, recreation and multiple use, education, research, watersheds, governmental activity, interaction in international forestry affairs and the role of professional foresters and related specialists in multiple use resource management. Lammi

FOR 591 Forestry Problems. Preq: Advanced undergrad. or grad. standing. Credits Arranged. Assigned or selected problems in silviculture, harvesting operations, lumber manufacturing, wood science, pulp and paper science, wood chemistry or forest management. Staff

FOR 599 Methods of Research in Forestry. Preq: Advanced undergrad. or grad. standing. Credits Arranged. Research procedures, problem analysis, working plan preparation, interpretation and presentation of results; evaluation of studies by forest research organizations; techniques and constraints in sample plots use. Staff

FOR GRADUATES ONLY

FOR (GN) 611 Forest Genetics. 3(3-0) S.

FOR (GN) 612 Advanced Topics in Quantitative Genetics. 3(3-0) F.

FOR 613 Special Topics in Silviculture. 3(2-1) F.

FOR 614 Advanced Topics in Forest Land Management. 3(3-0) F.

FOR 691 Graduate Seminar. 1(1-0) F,S.

FOR 692 Advanced Forest Management Problems. Credits Arranged.

FOR 699 Problems in Research. Credits Arranged.

Genetics

FOR UNDERGRADUATES

GN 301 Genetics in Human Affairs. 3(3-0) F,S. Fundamental principles of genetics presented at a level not requiring courses in biological sciences but sufficient for understanding the relation of genetics to society and technology. A survey of current knowledge of inheritance of human traits. McKenzie, Voelker

FOR ADVANCED UNDERGRADUATES

GN 411 The Principles of Genetics. Preq: BS 100 (Jr. standing). 3(3-0) F,S. An introductory course. The physical and chemical basis of inheritance; genes as functional and structural units of heredity and development; qualitative and quantitative aspects of genetics variation. Mettler

GN 412 Elementary Genetics Laboratory. Preq or coreq: GN 411. 1(0-2) F,S. Experiments and demonstrations provide an opportunity for practical experience in crossing and classifying a variety of genetic materials, particularly *Drosophila*.
Mettler, Graduate Assistants

FOR GRADUATES AND ADVANCED UNDERGRADUATES

GN 504 Human Genetics. Preq: GN 301 or 411, or equivalent. 3(3-0) S. The basic principles needed for an understanding of the genetics of man. Current knowledge and important areas of research in human genetics. Schaffer, McKenzie

GN 505 Genetics I. Preq: GN 411 or equivalent. 4(3-2) F. Part I of a foundation sequence for genetics graduate programs. A balanced and comprehensive survey of each of the major fields of genetics presented in integrated form. Concepts based upon family analysis and a study of individual organisms. Coverage includes general plant and animal genetics, biochemical and microbial genetics, and physiological and developmental genetics. Grosch, Kloos

GN 506 Genetics II. Preqs: GN 505, or 411 and CI. 4(3-2) S. The second portion of a two-semester sequence in general genetics, presented at the intermediate level and directed at beginning graduate students. Emphasis on the basic principles and modern concepts of cytogenetics, population, quantitative, and evolutionary genetics. Mettler, Staff

GN (ANS) 508 Genetics of Animal Improvement. 3(3-0) S. (See animal science, page 201.)

GN (PO) 520 Poultry Breeding. 3(2-2) F. (See poultry science, page 349.)

GN (ZO) 532 Biological Effects of Radiations. Preqs: BS 100 or GN 301 or CI. 3(3-0) S. Qualitative and quantitative effects of radiations (other than the visible spectrum) on biological systems, to include both morphological and physiological aspects in a consideration of genetics, cytology, histology, and morphogenesis.
Grosch

GN (ZO) 540 Evolution. Preq: GN 411; Undergraduate needs CI. 3(3-0) F. The facts and theories of evolution in plants and animals. The causes and consequences of organic diversity. Smith

GN (CS, HS) 541 Plant Breeding Methods. 3(3-0) F. (See crop science, page 232.)

GN (CS, HS) 542 Plant Breeding Field Procedures. 2(0-4) Sum. (See crop science, page 232.)

GN (CS) 545 Origin and Evolution of Cultivated Plants. 2(2-0) S. (See crop science, page 232.)

GN (ZO) 550 Experimental Evolution. Preq: GN 506 or CI. 3(3-0) F. Processes examined at the inter- and intra-population levels. A review of the results from experimental population studies and analyses of natural populations concerning variation patterns and adaptation, natural selection, polymorphism, hybridization, introgression, population breeding structure, isolating mechanisms, etc., is made and interpreted in relation to Darwinian and modern concepts of the origin of species. (Offered 1975-76 and alt. years.) Mettler

GN (BCH, MB) 561 Biochemical and Microbial Genetics. Preqs: BCH 351 or 551, GN 411 or 505, MB 401 or equivalent. 3(3-0) S. The development of the fields of biochemical genetics and microbial genetics emphasizing both techniques and con-

cepts currently used in research. Lectures and discussions of current research publications. Armstrong

FOR GRADUATES ONLY

GN (ANS) 603 Population Genetics in Animal Improvement. 3(3-0) F.

GN (FOR) 611 Forest Genetics. 3(3-0) S.

GN (FOR) 612 Advanced Topics in Quantitative Genetics. 3(3-0) F.

GN (CS, HS) 613 Plant Breeding Theory. 3(3-0) S.

GN (ST) 626 Statistical Concepts in Genetics. 3(3-0) S.

GN 631 Mathematical Genetics. 3(3-0) F.

GN 633 Physiological Genetics. 3(3-0) S.

GN 641 Colloquium in Genetics. 2(2-0) F,S.

GN 691 Seminar. 1(1-0) F,S.

GN 694 Selected Topics in Cytogenetics. 2(2-0) F.

GN 695 Special Problems in Genetics. 1-3 F,S.

GN 699 Research. Credits Arranged.

Geology

FOR UNDERGRADUATES

GY 101 Earth Science. Not to be taken after GY 120. 3(3-0) F,S. General geology; changes in the earth, and underlying physical and life processes.

GY 110 Physical Geology Laboratory. Coreq: GY 101 or 120. 1(0-2) F,S. The common rock forming minerals, the common rocks, topographic maps, geologic structures and geologic maps. Field trips.

GY 120 Physical Geology. Not to be taken after GY 101. 2(2-0) F,S. Dynamic processes acting on and within the earth; materials and makeup of the earth's crust. For laboratory, see GY 110.

GY 208 Environmental Physical Geography. 3(3-0) F,S. The physical conditions on the earth's surface that influence human activities; factors of man's environment, including planetary conditions, geographic location, climate and weather, soils and land forms.

GY 222 Historical Geology. Preq: GY 101 or 120. 3(2-3) S. Chronologic account of the geologic events during the development of the earth's crust, mainly in North America. Evolution and environmental significance of the principal fossil animal and plant groups. Field trips.

GY 323 Paleontology. Preq: GY 222. 3(2-3) F. Fossil life forms, with emphasis on classification and structure of the invertebrate animals and their application to problems of correlation of strata. Lecture, laboratories and field trips.

GY 330 Crystallography and Mineralogy. Coreq: GY 101 or 120. 3(2-3) F. The elements of morphological crystallography. Space lattices, crystal symmetry, systems and classes. Stereographic projection of common forms. Identification of minerals by crystallographic features, cleavage, fracture, luster, color, streak, hardness, specific gravity, etc. Chemical composition, varieties, occurrence, associations, important localities and uses. Crystal structures of selected minerals.

GY 331 Optical Mineralogy and X Ray Diffraction. Coreq: GY 101 or 120. 4(2-0) S. Techniques and underlying optical theory for identifying minerals with the polarizing microscope. Determination of index of refraction and birefringence; isotropic, uniaxial or biaxial character; optical sign and orientation. Adjunct apparatus for statistical and petrographic studies. Generation of x-rays, techniques and underlying theory for identifying by x ray diffraction.

GY 351 Tectonic Structures. Preq: GY 101 or 120. 3(2-3) F. Geologic stress-strain relationships of rocks and minerals at both surface and deep-seated conditions. Rock deformation due to brittle plastic and elastic failure. Analysis of both macroscopic and microscopic structures and fabrics superimposed on rocks. Field trips and field projects.

GY 400 Environmental Geology. Preq: GY 101 or 120. 3(2-1) S. Man's effect upon and interaction with such processes as mass-wasting soil development, erosion, transport and deposition of sediments, surface waters, groundwater, volcanism and earthquakes. Environmental aspects of mineral and petroleum usage and waste disposal as affected by geologic processes and materials.

GY 415 Mineral Exploration and Evaluation. Preqs: GY 440, 452. 3(2-3) S. Application of the principles of geology, geophysics and geochemistry to the discovery and evaluation of mineral deposits. Design of mineral exploration and development programs based on knowledge of the unique thermodynamic, geochemical and tectonic features that control mineral formation and concentrations in well-known mining districts, especially those yielding ferrous, base and precious metals. Review of economic and technological factors governing the value of mineral deposits. Field trips.

GY 440 Igneous and Metamorphic Petrology. Preq: GY 331. 4(3-3) S. Rocks that are formed at high temperatures and pressures by crystallization or solidification of molten magma or by solid-state recrystallization of older rocks. Application of principles of phase-rule chemistry, and of the results of modern high pressure-temperature laboratory research on the stability fields of crystalline phases to an understanding of igneous and metamorphic rocks. Identification, classification, occurrence, and origin of the principal igneous and metamorphic rocks.

GY 452 Sedimentary Petrology. Coreq: GY 331. 4(3-3) S. Identification, classification, geologic occurrences, origin and economic value of minerals, rocks and mineral deposits formed by physical, chemical and biological processes at low temperatures and pressures at and near the earth's surface. Hydrodynamics of sediment transport and deposition, settling velocities, and size sorting, chemical and biochemical precipitation from aqueous solutions. Principles of divisions of stratified terranes into natural units, correlation of strata, identification of depositional environments, and facies analysis.

GY 461 Engineering Geology. Preq: GY 101 or 120. 3(3-0) F. Applying geologic principles to engineering practice; analysis of geologic factors and processes affecting specific engineering projects. (Offered F 1975 and alt. years.)

GY 462 Geological Field Methods. Preq: GY 351 or CI. 3(1-5) S. Methods used to collect geologic data in the field. Introduction to geologic mapping and use of

geologic surveying instruments. Representation of geologic features by maps, sections, and diagrams. Field trips and field projects.

GY 465 Geological Field Procedures. Preqs: GY 351, 440, 462. 6 Sum. Six week summer field course. Practical field procedures and instruments used in geologic mapping. Observation and interpretation of geologic phenomena in their natural environment. Large and intermediate scale geologic mapping of earth's surface.

GY 491, 492 Seminar on Selected Geologic Topics. 1-3 F,S. Reports and discussion of geological topics of current interest with attention to methodology, bibliography and research techniques.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

GY 500 Regional Geology of North America. Preqs: GY 101 or 120, sr. standing. 1-6. Field study of classic geologic localities and geomorphic processes not indigenous to North Carolina. Typical areas are New England and adjacent Canada, northern Mexico and southwestern United States, and the Pacific Northwest. Representative subjects include the Canadian Shield, Precambrian mineral deposits, the San Andreas fault, desert geomorphology, Grand Canyon stratigraphy, modern and ancient reefs, and glaciated volcanoes. Mineral, rock, and fossil collecting. Student reports required.

GY 522 Petroleum Geology. Preq: GY 452. 3(3-0) S. Properties, origin, and modes of occurrence of petroleum and natural gas. Geologic and economic features of the principal oil and gas fields, mainly in the United States. (Offered S 1976 and alt. years.)

GY 524 Continental Evolution. Preqs: GY 222, 351, 440, 452. 3(3-0) F. The stratigraphic and tectonic events which have shaped the continents, with emphasis upon North America; field trips. (Offered F 1974 and alt. years.)

GY 532 Ore Microscopy. Preq: GY 331. 3(0-6) F. The theory and technique of microscopic investigation of opaque ore minerals, ores and mill products produced by benefication of ores. Studies of compositions and textures of materials in polished surfaces are based on observations of optical and physical properties, etch reactions and microchemical tests. (Offered F 1975 and alt. years.)

GY 542 Microscopic Petrography. Preq: GY 440. 3(1-4) F. Systematic study by microscopic techniques of the constitution and origin of consolidated rocks.

GY 545 Advanced Igneous Petrology. Preq: GY 440. 3(2-2) F. Physico-chemical principles related to igneous petrogenesis. General principles and specific problems including the origin, differentiation and emplacement of magmas and the possible relationships of igneous processes to global tectonics. (Offered F 1975 and alt.) years.)

GY 546 Advanced Metamorphic Petrology. Preq: GY 440. 3(2-2) F. The petrogenesis of metamorphic rocks including factors of metamorphism, metamorphic facies concept, metamorphic facies series, contact metamorphism, regional dynamothermal metamorphism, burial metamorphism, ACF-AKF diagrams and feldspars of metamorphic rocks. (Offered F 1974 and alt. years.)

GY 552 Exploratory Geophysics. Preqs: GY 351, PY 208 or 212. 3(3-0) S. Fundamental principles underlying all geophysical methods; procedure and instruments involved in gravitational, magnetic, seismic, electrical and other methods of studying geological structures and conditions. Spontaneous potential, resistivity, radioactivity, temperature, and other geophysical logging methods. Study of applications and interpretations of results (Offered S 1975 and alt. years.)

GY 563 Applied Sedimentary Analysis. Preqs: GY 452, ST 361. 3(2-2) F. Extension of GY 452, with emphasis on coarser grained detrital and chemical sedimentary rocks. Sampling of sedimentary population, critical study of assumptions underlying standard measurement techniques; treatment, testing and evaluation of sedimentary data; application to problems in sedimentology. (Offered F 1974 and alt. years.)

GY 564 Sedimentary Environments of Deposition. Preq: GY 452 or grad. standing. 3(2-3) S. Fabric of large sedimentary basins in terms of the spatial distribution of component major rock facies; current litho-genetic models illustrating internal lithic relationships, variability, and predictability; evolution of litho-genetic units; comparison with recent equivalents; field trips.

GY 565 Hydrogeology. Preq: GY 452. 3(3-0) S. Occurrence and sources of surface and subsurface water. Relationships of surface water to subsurface water. Rock properties affecting infiltration, movement, lateral and vertical distribution, and quality of ground water. Determination of permeability, capacity, specific yield, and other hydraulic characteristics of aquifiers. Principles of well design, legal aspects of water supplies. (Offered S 1975 and alt. years.)

GY 567 Geochemistry. Preq: CH 331 or 433. 3(3-0) F. The quantitative distribution of elements in the earth's crust, the hydrosphere and the atmosphere. Application of the laws of chemical equilibrium and resultant chemical reactions to natural earth systems. Geochemical application of Eh-pH diagrams. Geochemical cycles. Isotype geochemistry. (Offered F 1974 and alt. years.)

GY 581 Geomorphology. Preqs: GY 101 or 120 plus appropriate background. 3(2-3) F. Land forms and their relations to processes, stages of development, and adjustments to structure. Emphasis on mass-wasting, fluvial geomorphology of humid and arid climates, coasts, karst, and eolian processes. Lectures, map interpretations, and field trips.

GY 582 Quaternary Geology. Preqs: GY 101 or 120, sr. standing. 3(3-0) F. Glaciology, glacial geology, Pleistocene stratigraphy, periglacial geomorphology; Quaternary volcanism, tectonism, and sea-level fluctuations; late Cenozoic climate changes; field trips. (Offered S 1975 and alt. years.)

GY 583 Photogeology. Preq: GY 101 or 120. 3(2-2) S. The stereoscopic study of aerial photographs to obtain geologic information. The construction of bedrock and surficial geologic maps from aerial photographs. Aspects of remote sensing useful in geologic interpretation.

GY (MAS) 584 Marine Geology. Preqs: GY 452, or 101 or 120 plus appropriate background. 3(3-0) S. Morphology, structure and origin of ocean basins with their diverse features and their relations to the continents. Physical and chemical properties of the oceans, sedimentation in the marine environment and near-shore features. The economic potential of mineral resources derived from oceanic areas. (Offered S 1976 and alt. years.)

GY 593 Advanced Topics in Geology. Preq: CI. 1-6 F,S. Special study of some advanced phases of geology.

FOR GRADUATES ONLY

GY 611, 612 Advanced Economic Geology. 3(3-0) F,S.

GY 630 Geotectonics. 3(3-0) F.

GY 695 Seminar. 1(1-0) F,S.

GY 699 Geological Research. Credits Arranged.

History

FOR UNDERGRADUATES

INTRODUCTORY COURSES: (200 level) Open to all students without prerequisite. Previous course work in any particular field of history is not necessary in order to take any introductory course.

HI 204 Western Civilization to 1400. 3(3-0) F,S. A survey from earliest times to the end of the medieval era, treating the major civilizations which contributed to the development of Western Civilization.

HI 205 Western Civilization Since 1400. 3(3-0) F,S. A survey of Western Civilization from the Renaissance to the present.

HI 207 The Ancient World to 180 A.D. 3(3-0) F,S. The ancient cultures of the Middle East and Graeco-Roman civilization, including Egyptian, Minoan, Mycenean, Greek, and Roman societies and cultures.

HI 208 The Middle Ages. 3(3-0) F,S. Medieval civilization as it emerged from the declining Roman Empire through its apogee in the 13th century. The transition from the classical to the medieval world, the impact of the Germanic influx, and the political, economic, and social institutions of the High Middle Ages.

HI 209 Renaissance to Waterloo 1300-1815. 3(3-0) F,S. A survey of all aspects of the period of transition from the medieval to the modern world. Includes the decline of medieval institutions, the Renaissance, the Reformation and Counter-Reformation, rise of Absolutism, the English 17th-century revolution, the French Revolution and Napoleonic era.

HI 210 Europe in the 19th Century. 3(3-0) F,S. Major political, economic and cultural developments. Subjects are settlement of the Congress of Vienna, the impact of liberalism and nationalism, thought and culture of the 19th and 20th centuries, European imperialism, and the two World Wars and their aftermath.

HI 215 Latin America to 1826. 3(3-0) F,S. The origins and development of social political, economic and religious institutions from pre-conquest times to the achievement of independence. The ancient American cultures; Spain and Portugal before 1492; the conquest and settlement; Spanish rule in theory and practice; economic life; the Church; land and labor; the African contribution; the Portuguese in Brazil; the independence movements.

HI 216 Latin America Since 1826. 3(3-0) F,S. Social, political, economic and intellectual life in the 19th and 20th centuries. Major attention to Mexico, Argentina, Brazil, Peru and Cuba. Topics include the social structure of the new nations; 19th century liberalism; the force of tradition; relations with Europe and the United States; the Monroe Doctrine and U.S. intervention; economic change; caudillo rule; 20th century upheavals; the Mexican Revolution; Peron's Argentina; Castro and Latin America.

HI 233 The World in the 20th Century. 3(3-0) F,S. National and international problems in the Western and non-Western world, including institutions and ideas

at the turn of the century, origins and effects of the First World War, the post-war challenge to Western democratic supremacy from within and without, the Second World War, and problems of the post-war period.

HI 241 United States 1750-1789. 3(3-0) F,S. The European background of American history; establishment of English colonies in America; colonial historical development; the conflict with England, the securing of independence and the establishment of independent government.

HI 242 United States 1789-1845. 3(3-0) F,S. Inauguration of the new nation; territorial expansion and the westward movement; growth of democracy and social reform; development of national feeling and sectional tensions.

HI 243 United States 1845-1914. 3(3-0) F,S. The coming of the Civil War; the war and the reconstruction; the rise of industrialism and the Populist and Progressive response; the emergence of the United States as a world power.

HI 244 United States, Since 1914. 3(3-0) F,S. The United States and the First World War; the society in the 1920's; the Great Depression and the New Deal; the Second World War and post-war international problems; the Truman and Eisenhower years; America in the 1960's and 1970's.

HI 263 Traditional East Asia: Prehistory to 1800. 3(3-0) F,S. Introduction to the civilizations of China, Japan and Korea prior to the penetration of Western institutions and ideas.

HI 264 Modern East Asia: 1800 to Present. 3(3-0) F,S. The western impact and the responses in China, Japan and the smaller nations of East and Southeast Asia.

HI 265 Introduction to South Asian Civilization. 3(3-0) F,S. The traditional civilizations of the Indo-Pakistani sub-continent and the historical, political, economic, religious and literary factors which shaped the central thought patterns and institutions. Concentration on the major religious systems which are the core of the Indo-Pakistani way of life: Hinduism, Buddhism and Islam.

HI 266 Modern South Asia 1700 to Present. 3(3-0) F,S. Major developments from the British conquest to the present. Emphasis on the development of Indian and Pakistani nationalism under British rule, on the changes in Indo-Pakistani society under the impact of modernization and on post-independence histories of India and Pakistan.

HI 272 The Afro-American in America. 3(3-0) F,S. A brief consideration of his African background, and the particular role, experience and influence of the Afro-American at various stages in the development of the United States.

HI 298 Special Projects in History. 1-3 F,S. Utilized for guided research or experimental classes at the soph. level. Staff

FOR ADVANCED UNDERGRADUATES

NOTE: Prerequisite for 300 and 400 level courses: Three hours of history.

HI 321 Ancient and Medieval Science. 3(3-0) F. Selected topics to examine how pre-modern "science" differed from the science that emerged after the "Scientific Revolution" of the 17th century. The relations of science to social and economic factors, technology, magic, and religion. Examples from pre-history, Mesopotamia, Egypt, China, India, Greece, Rome, Islam and the Medieval and Renaissance West. Sylla

HI 322 Rise of Modern Science. 3(3-0) F,S. The "Scientific Revolution" of the 16th and 17th centuries. Analysis of Newton's System. The origins of modern chemistry, geology and evolution theory. The radical revision of Newtonian theory in the 20th century. These developments are considered within the context of the great historic movements of their time. Mulholland, Sylla

HI 341 Technology in History. 3(3-0) S. The role of technology in society from earliest times to the present. The achievements of technology and their impact on society as a whole are examined along with the social status, education, sources of support, and relationships to church and government of scientists and engineers in various periods. Mulholland

HI 351 English History (to 1688). 3(3-0) F,S. The evolution of the English constitution and the political, social and economic background of English cultural development. Begemann, Carlton, Downs

HI 352 English History (since 1688). 3(3-0) F,S. The evolution of the English constitution and the political, social, and economic background of English cultural development. Begemann, Carlton, Downs

HI (EC) 370 The Rise of Industrialism. 3(3-0) F. (See economics, page 236.)

HI (EC) 371 Evolution of the American Economy. 3(3-0) F. (See economics, page 236.)

HI 400 Civilization of the Ancient Near East. 3(3-0) S. The civilization of Mesopotamia and Egypt from earliest times to the fall of Babylon in 539 B.C. Sack

HI 403 Ancient Greek Civilization. 3(3-0) S. The history of the Hellenes from the Minoan civilization through Alexander's legacy, with readings in Herodotus and Thucydides. Sack

HI 404 Rome to 180 A.D. 3(3-0) F. Roman development from the Etruscans through Emperor Marcus Aurelius (180 A.D.). Examines through readings in Livy and Tacitus the great political achievement which saw Rome rise from a cattle-town on the Tiber to the head of an Empire. Riddle

HI 406 From Roman Empire to Middle Ages. 3(3-0) S. Using primarily translated Latin sources the course deals with the decline of Imperial Rome, and its succession by new Christian, Germanic, and Islamic civilizations. Riddle

HI 410 Italian Renaissance. 3(3-0) F. Renaissance humanism, an educational ideal and an awareness of man as the sole creator in the historical world, will be examined in its relationship to the Italian republics and princedoms of the 14th through the 16th century. Banker

HI 411 The Protestant and Catholic Reformation of the Sixteenth Century. 3(3-0) S. The conditions and criticisms which led to reform and the nature of the institutional and theological changes affected by the various churches and sects. Special attention to Luther and Calvin. Banker

HI 414 The Age of Absolutism. 3(3-0) F. Concentrates on the development of royal absolutism in 17th century Europe, the nature of the institutions which supported it, the particular cultural forms and patterns which it generated, and the reasons for its decline in the 18th century. Greenlaw

HI 415 Revolutionary Europe. 3(3-0) S. A broadly based analysis of Europe's first revolutionary era. The revolution in thought called the Enlightenment, the

causes and character of the Revolution in France, the impact of these events in France and Europe. Greenlaw

HI 418 Fascism in Germany and Italy, 1919-1945. 3(3-0) S. Hitler and Mussolini: Two aspects of European Fascism in the interwar period. Suval

HI 425 Tudor and Stuart England. 3(3-0) S. The permanent political crisis set into motion by the Reformation culminating in the English Civil War. Emphasis on certain key developments in social, political and economic life such as the development of a new concept of kingship, the growing independence of Parliament, the search for religious uniformity and the changing status of the aristocracy and gentry. Carlton

HI 428 England in the Age of the American Revolution. 3(3-0) F. English political, economic, social and imperial ideas and institutions between 1763 and 1783 with emphasis on how these affected and were affected by the War of the American Revolution. Downs

HI 429 Twentieth Century Britain. 3(3-0) S. British political, social and economic history since 1914, with reference to the effects of two world wars, the growth of the welfare state, British decline as a power, and the search for a new role in the world. Carlton

HI 430 Modern France. 3(3-0) S. The major trends since the downfall of Napoleon I with a short preliminary survey of the old regime and the revolutionary period 1789-1815. Cultural, economic, social and intellectual trends are stressed as well as the political. The ways in which France has been a seedbed for new movements in Europe. Brown

HI 432 Germany Since 1848. 3(3-0) S. German history from the revolutions of 1848 to the present, concentrating on problems of nationalism and political and social reform. Suval

HI 435 A Century of Nationalism: East-Central Europe, 1848-1948. 3(3-0) S. Nationalistic movements, largely within the Austro-Hungarian, Russian, Ottoman, and German Empires for independent sovereignty, and with the attainment of this goal the continuing conflicts within and between the successor states and their roles in the conflicts of the great 20th century forces. Brown

HI 438 History of Russia to 1881. 3(3-0) F. The social, political, economic and cultural history of Kiev Rus., Muscovy and Imperial Russia through the emancipation of the serfs and the fundamental reforms that followed. Emphasis on internal developments; some attention to foreign policy. Wheeler

HI 439 History of Russia Since 1881. 3(3-0) S. The history of Russia and the Soviet Union from the great reforms of the 19th century to modern times, emphasizing political, religious, and cultural trends that underlie the development of the Russian state and society and the position of the U.S.S.R. in the world today. (Some attention to foreign policy with emphasis on Soviet period.) Wheeler

HI 442 The United States: Revolution to Constitution. 3(3-0) F. The conflict with Great Britain after 1763 leading to the declaring of independence; the war for American independence in its military and diplomatic aspects; the domestic problems; the foreign relations in the post-war years; the establishment of government in the new nation. Staff

HI 443 The Age of Jefferson. 3(3-0) S. The political, social, economic, intellectual and diplomatic aspects of United States history from the adoption of the Constitution in 1789 through the second Madison administration. Establishment of the

federal government; implementation of Hamilton's financial system; foreign affairs during the Wars of the French Revolution; rise of political parties; triumph of the Jeffersonian Republicans; territorial expansion of the United States; War of 1812. Wishy

HI 444 The Age of Jackson, 1815-1850. 3(3-0) F. Political, social, cultural and economic developments from the Era of Good Feelings to the Compromise of 1850. Readings organized around four major interpretations of the period. King

HI 446 Civil War and Reconstruction. 3(3-0) S. The period of sectional strife and war. Examination of the impact of the war on the United States and the efforts to reconstruct the South on a national basis. Harris

HI 448 Populism and Progressivism. 3(3-0) F. The two most important general reform movements in the United States during the late 19th and early 20th centuries, the "agrarian crusade" and the Progressive movement, are examined in the context of the economics, politics, society, and ethics of their time. Noblin

HI 452 Recent America. 3(3-0) F. Some of the major problems in American life since 1939. Hobbs

HI 454 U.S. Foreign Relations. 3(3-0) F. The origins of American foreign policy and the conduct of diplomacy in the era since the United States became a world power. Stresses complex array of personalities, ideas, institutions and forces involved in shaping and implementing policy. Beers

HI 458 Significant Figures in 20th Century America. 3(3-0) S. The impact on American life in the 20th century of important people in fields of politics, war and peace, sports and various forms of communication. Hobbs

HI 461 Civilization of the Old South. 3(3-0) S. The distinctive features of the Old South as part of the regional development of United States history. Consideration of colonial factors in the making of the South, development of the plantation system and Negro slavery, Southern social order, intellectual and cultural life, economic development, and rise of Southern nationalism. Elliott

HI 463 North Carolina to 1860. 3(3-0) F. North Carolina history from the earliest explorations through the 1850's. Elliott

HI 464 North Carolina Since 1860. 3(3-0) S. North Carolina history from the eve of the Civil War to the present. Noblin

HI 467 Modern Mexico. 3(3-0) F. Major developments in Mexican national life since 1821. The 19th century: the era of Santa Anna, the war with the United States, the Reform, the French intervention, and the dictatorship of Porfirio Diaz. The 1910 Revolution and the resulting transformation of Mexico's political, social and economic institutions. Reading knowledge of Spanish helpful, but not required. Beezley

HI 469 Twentieth-Century Latin American Revolutions. 3(3-0) F. The variety of revolutionary changes in certain 20th century Latin American republics. Concentrates on Argentina, Bolivia, Peru, and Cuba, but includes some other nations. Examines movements dedicated to the overthrow of traditional liberal institutions and their replacement by other political, social, and economic systems. Beezley

HI 471 Revolutionary China. 3(3-0) S. The failure of traditional Chinese society to find means of accommodation with the West. The emergence of the revolutionary Communist state and society. Metzgar

HI 472 Modern Japan, 1850 to Present. 3(3-0) F. Japan's emergence as a nation and world power. Czupryna

HI 473 20th Century Asian Revolutionaries. 3(3-0) S. Use of psycho-historical techniques for the comparative study of the lives and works of great figures in 20th century Asia: Sun Yat-sen, Mao Tse-tung, Mohandas Gandhi and Jawarharlal Nehru. Metzgar

HI 477 British Empire and Commonwealth. 3(3-0) S. The evolution of colonial self-government and the transformation of imperial relationships in the former British dependencies in Canada, the West Indies, Africa, Asia, and the Pacific Islands. Downs

HI 491 Seminar in History. 3(3-0) F,S. Open to srs. in history, other srs. and grad. students with departmental permission. Staff

HI 492 Seminar in History. 3(3-0) F,S. Required of all HI majors. Open to other srs. and grad. students with departmental permission. Staff

HI 498 Special Topics in History. 1-6 F,S. Extensive readings on predetermined topics focused around a central theme. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

NOTE: Prerequisite for all history courses at the 500 and 600 level is six hours of advanced history or equivalent.

HI 515 High Middle Ages. 3(3-0) S. An analysis of medieval culture. Topics such as the revival of the Roman Empire, monastic and papal reform, the rise of universities, the evolution of representative bodies, the Gothic style, troubadour and goliardic poetry, scholasticism, and the revival of Roman law. Riddle

HI 530 Era of the French Revolution and Napoleon. 3(3-0) F. Aspects of the French Revolution and the Napoleonic era which are currently subject to differing interpretations. Greenlaw

HI 532 History of Great Britain, 1820-1914. 3(3-0) F. Great Britain from the Regency of George IV to the outbreak of World War I with emphasis on the most significant developments in constitutional, religious, and economic ideas and institutions. Downs

HI 536 History of International Relations Since 1870. 3(3-0) F. European diplomatic history and world international relations from the Franco-Prussian War through both World Wars up to the present. Emphasis on policies and attempts to solve international problems. Brown

HI 545 The American Civil War. 3(3-0) F. Events that led to the disruption of the union and intensive study of the war, emphasizing non-military aspects. Only the major military campaigns are discussed. Harris

HI 546 Reconstruction of the American Union. 3(3-0) S. The difficulties involved in the restoration and readjustment of American society after the Civil War. Attention to social and economic conditions in the defeated South, military reconstruction and Republican ascendancy in the region. Harris

HI 548 The American Response to Industrialism. 3(3-0) S. The industrialization of the American economy and efforts to deal with the ensuing transformation of American life through politics, social institutions and ideas. Noblin

HI 551 History and Principles of the Administration of Archives and Manuscripts. 3(3-0) F. The nature, importance and use of original manuscript resources; the history and evolution of written records, and the institutions administering them. Mitchell

HI 552 Application of Principles of Administration of Archives and Manuscripts. Preq: HI 551. 3(3-0) S. Internship training applies principles and practices of archival management. Mitchell

HI 561 U.S. Far Eastern Relations. 3(3-0) S. American expansion into the Pacific and involvement in Asian affairs. Both official diplomatic relations and unofficial contacts (by missionaries, educators, businessmen, and the like) which influenced Americans. Beers

HI 565 The History of Urban Life in the U.S., 1607-1865. 3(3-0) F. Designed to give an understanding of the historical background of today's urban problems. King

HI 566 The History of Urban Life in the U.S., 1865-Present. 3(3-0) S. Designed to give the student an understanding of the historical background of today's urban problems. King

HI 575 History of Soviet Russia Since 1930. 3(3-0) F. An analysis of the domestic and foreign policies of the Soviet Union since 1930 with emphasis on the position of the Soviet Union in the world since 1945. Wheeler

HI 598 Special Topics in History. 1-6 F,S. Topics of interest to advanced students under faculty direction on a tutorial basis. Staff

FOR GRADUATES ONLY

HI 601 Historiography and Historical Method. 3(3-0) F.

HI 602 Seminar in American History. 3(3-0) S.

HI 604 Seminar in European History. 3(3-0) S.

HI 606 Seminar in Diplomatic History. 3(3-0) S.

HI 699 Research in History. Credits Arranged.

Horticultural Science

FOR UNDERGRADUATES

HS 201 Principles of Horticulture. 3(3-0) F,S. Basic principles of production, processing and utilization of fruit, vegetable, flower, and ornamental crops. The economic importance and distribution of horticultural enterprises. The roles of horticulture in world nutrition and food supply, improvement of environmental quality in the landscape, aesthetic values, and medicinal uses. Cochran

HS 211, 212 Ornamental Plants. Preq: BS 100. 3(1-5) F,S. Identification, distribution, growth characteristics, adaptation, and usage of ornamental trees, shrubs, vines, and herbaceous plants in the landscape. Southall

HS 301 Plant Propagation. Preq: BS 100, or BO 200. 3(2-2) F,S. The principles, methods, and practices in seedage, cuttage, division, budding, grafting, and other methods of propagation. Influence of hereditary, environmental, and pathological variations on the plant products. Galletta

HS 342 Landscape Horticulture. 3(2-3) F,S. Application of design principles to landscaping small properties and selecting and planting trees, shrubs, flowers, and lawn grasses. Students will work out detailed landscape plans. Field trips to homes and gardens. Staff

HS 411 Nursery Management. Preqs: BS 100, SSC 200. 3(2-3) F,S. Principles and practices of production, management, and marketing of field-grown and container-grown nursery plants. Field trips. Staff

HS 414 Residential Landscaping. Preqs: HS 211, 212, SSC 200. 4(2-6) F,S. Landscape planning and development of residential properties to create an aesthetic and functional composition to complement the home. Required completion of planting plans including design, plant lists, planting details, and technical specifications. Staff

HS 421 Fruit Production. Preqs: BS 100, SSC 200. 3(2-3) F. Identification, adaptation, and methods of production and marketing of the principal fruit crops. Modern practices as related to selection of sites, nutritional requirements, management practices, and marketing procedures. Correll

HS 432 Vegetable Production. Preqs: BS 100, SSC 200. 3(2-3) F. The origin, importance, distribution, botanical relationships, and principles of production and marketing of the major vegetable crops. Commercial production stressed. (Offered F 1974 and alt. years.) Miller

HS 441 Floriculture I. Preqs: BS 100, SSC 200. 3(2-3) F. Greenhouse site selection and construction. The influence and control of environmental factors affecting growth and flowering of floricultural crops. (Offered F 1975 and alt. years.) Larson

HS 442 Floriculture II. Preqs: BS 100, SSC 200. 3(2-3) S. Cultural requirements and marketing procedures for floricultural crops. Acquaintance with these crops through classroom and laboratory experiences. (Offered S 1976 and alt. years.) Larson

HS 471 Arboriculture. Preqs: BS 100, SSC 200. 3(2-3) S. Principles and practices for care and maintenance of ornamental trees and shrubs. Transplanting, fertilization, control of insects and diseases, bracing and cabling, and control of tree growth by chemical or pruning techniques. (Offered S 1976 and alt. years.) Staff

HS 491 Senior Seminar in Horticultural Science. Preq: Consent of department. 1(1-0) F,S. Presentation of scientific articles, progress reports in research, and special problems in horticulture and related fields. Department Head

HS 495 Special Topics in Horticultural Science. 1-6 F,S. Study in one or more of the following: an intensive literature review, experimental investigation with instructor guidance, or new course development on a trial basis. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

HS (CS) 514 Principles and Methods in Weed Science. Preq: CS 414 or equivalent. 3(2-2) S. Losses caused by weeds, the ecology of weeds, biological control, basic concepts of weed management, herbicide-crop relationships and herbicide develop-

ment. Introduction to greenhouse and bioassay techniques used in herbicide work and to field research techniques supplemented by laboratory and field exercises. Monaco

HS (FS) 521 Food Preservation. 3(2-3) F. (See food science, page 270.)

HS (CS, GN) 541 Plant Breeding Methods. 3(3-0) F. (See crop science, page 232.)

HS (CS, GN) 542 Plant Breeding Field Procedures. 2(0-4) Sum. (See crop science, page 232.)

HS 552 Growth of Horticultural Plants. Preq: BO 421. 3(2-3) F. Exercises in tissue culture principles and techniques as they relate to horticulture. Emphasis on endogenous controls of plant growth and the role of growth regulating compounds in horticultural research and production. Graduate Staff

HS (FS) 562 Post-Harvest Physiology. Preq: BO 421. 3(3-0) S. Chemical and physiological changes that occur during handling, transportation, and storage which affect the quality of horticultural crops. Preharvest and postharvest conditions which influence these changes. Graduate Staff

HS 599 Research Principles. Preq: CI. 1-6 F,S. Investigation of a horticultural problem under faculty direction. Practice in experimental techniques and procedures, critical review of literature and scientific writing. The problem may last one or two semesters with credits determined by the nature of the problem. A written report and final oral exam are required. Graduate Staff

FOR GRADUATES ONLY

HS (CS, GN) 613 Plant Breeding Theory. 3(3-0) S.

HS (CS, SSC) 614 Herbicide Behavior in Plants and Soils. 3(3-0) F., 1975 and alt. years.

HS 621 Methods and Evaluation of Horticultural Research. 3(3-0) F.

HS 622 Mineral Nutrition in Plants. 3(2-3) S. (Offered S 1975 and alt. years.)

HS 691 Seminar. 1(1-0) F,S.

HS 699 Research. Credits Arranged.

Industrial Arts

FOR UNDERGRADUATES

IA 100 Introduction to Industrial Arts. 1(1-0) F. Orients the student to college life and to the philosophy, objectives and scope of industrial arts as related to teacher education and industrial employment. A study of professional problems and opportunities. Staff

IA 102 Fundamentals of Materials and Processes. 4(2-4) F,S. Systematic study of structure and characteristics of selected materials and the processes utilized in shaping. forming, cutting, machining and finishing them into products. Attention to the requirements of manufacturing of products. Experiences in graphic communication, demonstrations of hand and machine tools, and student participation in laboratory problems in the identification and testing of materials. Staff

IA 103 Drafting I. 3(1-4) S. Service course for agricultural education. Graphical communication encompassing sketching and instrument drawing. Theory and practice taught through the medium of freehand sketching involving oblique, isometric, perspective, exploded, assembly, sections and ortheographic projection type drawings. Also, blackboard sketching. Troxler

IA 105 Drafting. Preq: IA 102. 4(2-4) F,S. Theory and practice in technical communication through the sketching and drafting media. Practice in both sketching and instrument drawing in the orthographic projection, pictorial drawing, sections, revolutions and sheet metal development. Troxler

IA 203 Technical Sketching. 2(1-2) S. The application of drawing practices for the layman. Freehand sketching, pictorial representation, production sketches, template drawing, exploded views, shades and shadows. Individual problems and selected graphic representation. Troxler

IA 205 Industrial Arts Design. Preq: IA 100, 209, and 210. 3(1-4) F,S. Design as it relates to industry and the industrial arts laboratory. Creative design and individual expression through problems involving utilization of industrial material for human needs. Troxler

IA 209 Wood Processing. Preq: IA 102. 4(2-4) F,S. Provides an orientation to the processes of designing, developing and producing wood products through lectures, discussions and planned experiences in the various woodworking areas. Emphasis on planning and developing wood products in the industrial arts laboratory, and on an analysis of typical products and industrial practices. A research report will be required. Staff

IA 210 Metal Technology. Preqs: IA 102, 105. 4(2-4) F,S. Provides an orientation to the process of designing, developing and producing metal products. Instruction will be through lectures, discussions and planned experiences in the basic metalworking areas. Emphasis on planning and developing of metal products in the industrial arts laboratory, coupled with analysis of typical products and industrial practices. A research report will be required. Baker

IA 230 Drafting II. Preq: IA 105. 3(1-4) S. Laboratory exercises in problem solutions through the drawing method. The skill of application and utilization of drawing as a means of communication will be emphasized. Troxler

IA 304 General Shop Organization. Preqs: IA 105, 209, 210, 312. 2(1-2) S. Application of principles of general shop organization and operation. Analysis of products. Methods and techniques of production of laboratory projects including a variety of materials suitable to varying educational levels. Young

IA 306 Graphic Arts. Preq: IA 102. 4(2-4) S. An introduction to the basic printing areas of letterpress, offset, photography, silk screen and bookbinding with emphasis on course outline and subject matter for the secondary schools. Bame

IA 312 Electricity-Electronics. Preqs: PY 211, 212 or CI. 4(3-3) F,S. The basic principles of electricity and electronics; AC and DC circuits; electrical machinery; and electronics, including power supplies, amplifiers, oscillators and tuned circuits. Applications and examples of the common experiences such as power and light circuits, motors and controls, measuring and servicing instruments, power supplies, amplifiers, radios, and electronic control circuits. Young

IA 315 General Ceramics. 3(1-4) S. Work with ceramic materials as a medium of expression. Experience in the basic manufacturing processes of the ceramic industry. Emphasis on the sources of clay, designing, forming, decorating and firing of ceramic products. Staff

IA 412 Electrical Practicum. Preq: IA 312 or equivalent. 3(1-4) S. A study of design, layout and construction of basic apparatus in the fields of electricity and electronics. Emphasis upon use of tools and hardware of the electrical trades.
Young

IA 465 Independent Study in Industrial Arts. Maximum 6. Preq: Sr. standing. Designed to develop problem-solving ability through research activities in industrial arts. Problems in industrial arts curriculum, method and content are selected, designs or plans of action are prepared, and final papers are presented and defended before a faculty committee. Staff

IA 480 Modern Industries. Preq: Sr. standing. 3(3-0) F,S. Overview of modern industry's function and organization. Principles of work simplification, motion economy, processing and scheduling. The effects of technological change on labor, management and consumer. Attention on contributions of technology to specific industrial processes in machining, forming, fabricating in relationship to principles, types of equipment and usage areas. Young

IA 484 School Shop Planning and Equipment Selection. 3(3-0) F. The physical planning of school shops and laboratories; selection of tools and equipment. Whenever possible, actual contemplated school buildings will be used for class work.
Bame

IA 510 Design for Industrial Arts Teachers. Preqs: Six hours drawing, IA 205 or equivalent. 3(2-2) Sum. New developments in design emphasizing the relationship of material and form in the selection and designing of industrial arts projects.
Graduate Staff

IA (ED) 560 New Developments in Industrial Arts Education. Preqs: 12 hours ED, teaching experience. 3(3-0) F,S. Assists teachers and administrators in developing new concepts and new content based on the changes in technology. They will be required to reevaluate their programs considering new concepts and content.
Graduate Staff

IA 590 Laboratory Problems in Industrial Arts. Preqs: Sr. standing, CI. Maximum 6. Based on individual problems and designed for advanced majors in industrial arts education. An opportunity to broaden or intensify knowledge and abilities through investigation and research in metals, plastics or ceramics.
Graduate Staff

IA 592 Special Problems in Industrial Arts. Preq: One term of student teaching or equivalent. Maximum 6. Purpose is to broaden the subject matter experiences in industrial arts. Problems involving experimentation, investigation and research in one or more industrial arts areas will be required. Graduate Staff

IA (ED) 595 Industrial Arts Workshop. Preq: One or more years of teaching experience. 3(3-0) Sum. For experienced teachers, administrators and supervisors of industrial arts to develop sound principles and practices for initiating, conducting, and evaluating programs. Enrollees will pool their knowledge and practical experiences and will do intensive research work on individual and group programs.
Graduate Staff

FOR GRADUATES ONLY

IA 645 Technology and Industrial Arts. 3(3-0) F,S.

IA (ED) 660 Industrial Arts Curriculum. 3(3-0) F,S,Sum.

Industrial Engineering

IE 200 Introduction to Industrial Engineering. 1(0-3) F. Industrial and management engineering practices and concepts in operational planning and control, human performance, resource allocation, manufacturing management, and/or management systems. Illustrations of such functions in industrial, commercial, government or service organizations. Site visits, discussions and problems which relate to the design and operation of integrated systems of humans, machines, information and materials. Smith, Nuttle

IE 241 Furniture Manufacturing Processes I. Preq: E 240. 3(3-0) S. Survey of furniture manufacturing technology, emphasizing equipment and its relationship to furniture product engineering. Clark

IE 301 Engineering Economy. Preq: MA 111. This course not open to students scheduling IE 311. 3(3-0) F,S,Sum. Criteria and techniques for management and engineering decisions in relation to economy of design, selection and operation. Effects of depreciation policies and machine replacement consideration. Problem solving and development of detailed project economy studies. Tucker

IE 311 Engineering Economic Analysis. Preq: Soph. standing. 3(3-0) F,S. Engineering and managerial decision making. The theory of interest and its uses. Equivalent annual costs, present worths, internal rates of return, and benefit/cost ratios. Accounting depreciation and its tax effects. Economic lot size and similar cost minimization models. Sensitivity analysis. Cost dichotomies: fixed vs. variable, and incremental vs. sunk; use of accounting data. Replacement theory and economic life. Engineering examples. Bernhard

IE 321 Business Data Processing. Preq: CSC 111. 3(2-2) F,S. The nature, flow, characteristics and handling of business data; classifying, sorting and calculating using unit record and business machines; collection for and processing data on digital computers; information storage and retrieval, filing systems; computer programming of business problems, report generation, integration of data flows. Emphasizes programming of several small projects. Llewellyn

IE 328 Manufacturing Processes. Preq: MAT 201. 3(2-3) F,S. Manufacturing operations for mechanical component parts and assembled products emphasizing: 1) Capabilities and limitations of the various processes; 2) The concept of manufacturability, i.e. the interaction between product design, material, process, machine, man, and cost. These points illustrated experimentally. Harder

IE 332 Motion and Time Study. Preq: ST 361. 4(3-3) F,S. Principles and methodology of operation process charting; methods and analysis; motion and micromotion study; and man-machine relationships. Use of predetermined time data; time study procedures, including performance rating, determination of allowances based on workplace, and environmental factors; and applications of wage incentives. Anderson

IE (PSY) 338 Human Factors in Equipment Design. Preq: PSY 337 or IE 332. 3(2-2) F. Methodology including equipment design, biomechanics, and accident study. Man's sensory, motor, and decision-making abilities are related to problems of systems design, operator efficiency, and safety as these involve displays, controls, work-place layout, and environmental stressors. Pearson

IE 340 Furniture Manufacturing Processes II. Preqs: IE 241 and WPS 205. 4(2-6) F. Survey of technology, emphasizing sequence of operations, production rate and the integration of many types of equipment into a manufacturing system. Prak

IE 341 Furniture Plant Layout and Design. Preq: IE 340. 3(1-6) S. Problems in furniture manufacturing plant design; building structures, equipment location, space utilization, layout for operation and control, allied topics in power utilization light, heat, ventliation and safety. Prak

IE 343 Plant Layout and Materials Handling. Preqs: IE 328 and 332. 3(1-4) F,S. Obtaining the most effective utilization of men, materials, and machines as related to space and costs. Alvarez

IE 345 Principles of Upholstering. Preq: IE 241. 2(2-0) S. Properties and evaluation of seating equipment. Technology of flexible foam materials; slab foam; molded foam; stress strain diagrams; compression set; evaluation tests. Properties of coil springs and sinuous wire springs. Properties of fibrous filling materials. Upholstering constructions. Testing of upholstered furniture. Manufacturing procedures. Cost aspects. Prak

IE 346 Furniture Design and Construction. Preq: IE 340. 2(2-0) S. Selected topics. Emphasis is on panel construction, panel manufacturing and finishing methods and the application in knock down furniture construction. (Offered in alt. years.) Prak

IE 351 Manufacturing Engineering. Preq: MAT 201. 3(2-3) F. Operations employed in the manufacture of mechanical component parts and assembled products with emphasis on: 1) Capabilities and limitations of the various processes in practice; 2) The concept of manufacturability, i.e. the interaction between product design, material, process, machine, man and cost; and 3) The theories associated with these processes. Laboratory periods illustrate and verify points. Harder

IE 352 Work Analysis and Design. Preq: Course in mathematical statistics. 3(1-4) S. Work methods and production processes to improve operator effectiveness and reduce production costs. Techniques studied include those successfully applied in industry such as operation analysis, motion study, value engineering, predetermined time systems, time study and line balancing. The engineering approach to man-machine relationships, methods improvement, standardizing work procedures, and accurate measurement of labor content. Data obtained provide the basis for managerial controls. Anderson

IE 353 Statistical Quality Control. Preq: Course in mathematical statistics. 3(3-0) F. The natural variations of products produced by industrial processes are explained using statistical techniques. Different controlling methods and their uses are shown through realistic examples. Methods to determine process capabilities are analyzed and economic implications are explained. Sampling techniques and decisions under uncertainty are applied to problems in the industrial environment. Alvarez

IE 354 Human Factors Engineering. Coreq: IE 352. 3(2-2) F,S. Designed for IE majors. Basic anatomy and physiology with emphasis on how to use this knowledge in designing equipment; system analysis from the standpoint of the operator; the use of anthropometric data in designing equipment; and design and layout of displays, controls, and workspaces. Pearson, Ayoub

IE 355 Introduction to Occupational Safety & Health. Preq: Soph. standing. 3(3-0) F,S. Provides a basic understanding of safety and health practices of contemporary concern to the plant manager, safety engineer, etc. Emphasizes the applications of human factors, biomechanics, work physiology, toxicology, statistics, and engineering in accident prevention and control. Specific instruments used in the measurements of safety and health problems. Ayoub

IE 361 Quantitative Methods in Industrial Engineering. Preq: MA 301. 3(3-0) F. Mathematical tools and approaches used including linear algebra, techniques in maxima and minima, and modelling. Potential applications to IE-oriented problems. Magazine

IE 401 Industrial Engineering Analysis I. Preq: IE 361 or MA 405. 3(3-0) F,S. Linear programming methods and their applicability in IE; the transportation method and scheduling in transportation and production problems; the simplex method in production planning and scheduling; upper bound, integer, parametric and primal-dual methods; queueing processes. Nuttle

IE 402 Industrial Engineering Analysis II. Preq: IE 401. 3(3-0) F. Aspects of operations research methods with emphasis on their IE applications; replacement theory, sequencing problems, inventory control methods and dynamic programming and their applications. Nuttle

IE 403 Industrial Engineering Analysis III. Preq: IE 401. 3(3-0) S. Operations research methods with emphasis on their IE applications; stochastic and Markov processes; finite and infinite queueing models; industrial control methods, and industrial dynamics. Magazine

IE 408 Production Control. Preqs: IE 361, 401. 3(3-0) S. Forecasting, production planning, models for scheduling and sequencing, inventory models and operational systems, as well as the reporting and evaluation functions necessary for the design and control of a production system. Application of quantitative methods to these areas of application. Kulonda, Alvarez

IE 420 Manufacturing Controls. Preq: IE 301. 3(3-0) F,S. Theory and methodology for developing and maintaining profitable manufacturing operations. Development of principles and procedures for control of materials, manpower and costs. Special attention to production and inventory control, equipment utilization, wage classification and cost reduction programs. Tucker

IE 421 Data Processing and Production Control Systems. Preqs: IE 352 and CSC 111. 3(3-0) F,S. Design of integrated control systems necessary for effective management of production. Includes the methods of systems design, the basic concepts of computer processing systems, the design of control procedures and reports, and their application to automated data processing equipment. Emphasis on the design of control procedures for production scheduling, labor performance, quality control, and inventory control. Systems flow charts; block diagrams in system applications. Llewellyn

IE 432 Standard Data. Preq: IE 332. 3(3-0) S. Developing standard data from measured and predetermined time data; methods of analysis and synthesis; applications of standard data in production planning and scheduling wage incentive plans. Staff

IE 440 Furniture Management Analysis. Preq: IE 341. 3(1-4) F. Economic decision making applied to the furniture industry. The selection of equipment, materials, methods and strategy, from several feasible alternatives is studied with the aid of actual case histories. Prak

IE 443 Quality Control. Preq: ST 361. 3(2-2) F,S,Sum. Statistical methods in quality control; control charts for variables and attributes; inspection sampling plans and procedures. Industrial applications. Anderson

IE 453 Facilities Design. Preq: Sr. standing in IE. 3(1-4) F. Project of an industrial plant to be designed by small groups of students taking complete initiative and responsibility in procuring the information required by the realistic design

for industrial enterprise. Charts of the facilities and a report justifying the design feasibility from the technical, economic, and environmental impact viewpoint produced by each group. Alvarez

IE 495 Project Work in Industrial Engineering. Preq: Sr. standing. 2-6 F,S. Special investigations and research related to furniture construction and processing, and other assigned problems. Staff

IE (OR, MA) 505 Mathematical Programming I. Preq: MA 405. 3(3-0) F,Sum. Mathematical methods applied to problems of planning, especially linear programming. Rigorous and complete development of the theoretical and computational aspects; discussion of applications. Graduate Staff

IE (OR) 509 Dynamic Programming. Preq: MA 405, ST 421. 3(3-0) S,Sum. Theory and computational aspects of dynamic programming and its application to sequential decision problems. Elmaghraby, Nuttle

IE 511 Advanced Engineering Project Analysis. Preqs: IE 311, ST 421. 3(3-0) F. Analysis of project economy models with certainty assumed; advantages and limitations of models, effects of income tax and depreciation methods. Risk analyses employing probability concepts; sensitivity studies and measures of utility. Estimation techniques and use of accounting information, time series analysis and judgment factors. Planning and uses of capital funds. Bernhard

IE 515 Process Engineering. Preqs: IE 328, 443. 3(3-0) F. The technical processes of translating product design into a manufacturing program. The application of industrial engineering in the layout, tooling, methods, standards, costs and control functions of manufacturing. Laboratory problems covering producer and consumer products. Harder

IE 517 Automatic Processes. Preqs: IE 328, 443. 3(3-0) S. Principles and methods in design of product, process and controls. Economic, physical and sociological effects of automation. Harder

IE 521 Control Systems and Data Processing. Preq: IE 421. 3(3-0) S. The problems and techniques required for systematic control of the production process and the business enterprise. Determination of control factors; collection and recording of data; and processing, evaluation and use of data. Illustrations of the applications and use of data processing equipment. Case problems. Llewellyn

IE (OR) 522 Dynamics of Industrial Systems. Preq: IE 421. 3(3-0) F. Introduction to servomechanism theory as applied to company operations. Simulation of large nonlinear, multi-loop, dynamic, stochastic systems on a digital computer; methods of determining modifications in system design and/or operating parameters for improved system behavior. Llewellyn

IE 523 Inventory Control Methods I. Preqs: ST 421, ST 515, OR 501. 3(3-0) S. Inventory policy with respect to reorder sized, minimum points and production schedules. Simple inventory models, models with restrictions, price breaks, price changes, analysis of slow-moving inventories. The smoothing problem in continuous manufacturing. Applications of linear and dynamic programming. Alvarez

IE (PSY) 540 Human Factors in Systems Design. Preqs: IE (PSY) 338 or IE 354; Coreqs: ST 507 or 515. 3(3-0) S. Problems of the systems development cycle, including man-machine function allocation, military specifications, display-control compatability, the personnel subsystem concept, and maintainability design. Man as an information processing mechanism. Pearson

IE 541 Research Methods in Accident Study. Preqs: IE (PSY) 338 and ST 421. 3(2-2) F. Methods used in accident-injury study, including field investigation, experimental engineering and biomedical research, statistical studies, and computer simulation. Pearson

IE 542 Physiological Criteria in Work Measurement. Preq: Grad. status. 3(3-0) F. A background of physiological knowledge appropriate to the study of men at work. Application to the study of equipment design and its use. (Offered in alt. years.) Ayoub

IE 544 Occupational Biomechanics. Preq: Grad. standing in Engr. 3(2-2) F. Understanding the anatomical and physiological bases of human motion. Characteristics and limitations of human motor capabilities, body mechanics, and use of biomedical instrumentation for monitoring and quantifying human performance. Applications of biomechanics in work, industry, rehabilitation, sports, space research, and safety. (Offered in alt. years.) Ayoub

IE 546 Advanced Quality Control. Preqs: IE 353, ST 421. 3(3-0) S. The statistical foundations of quality control and its economic implications. Mathematical derivations. Sampling techniques are treated extensively with applications. Graduate Staff

IE 547 Engineering Reliability. Preqs: IE 353, ST 421. 3(3-0) S. Methodology including application of discrete and continuous distribution models and statistical designs; reliability estimation, structure models, demonstration and decisions, and growth models. Examples of reliability evaluation and demonstration program. Graduate Staff

IE (OR) 561 Queues and Stochastic Service Systems. Preq: MA 421. 3(3-0) F. General concepts of stochastic processes. Poisson processes, Markov processes, and Renewal theory are used in the analysis of queues with varied parameters. Applications to engineering problems. Magazine

IE (OR) 586 Network Flows. Preq: IE (OR, MA) 505 or equivalent. 3(3-0) S. Problems in the determination of the shortest chain, maximal flow, and minimal cost flow in networks. The relationship between network flows and linear programming; problems with nonlinear cost functions, multicommodity flows, and network synthesis. (Offered in alt. years.) Graduate Staff

IE 591 Project Work. Preq: Grad. or sr. standing. 1-6 F,S,Sum. Investigation and report on an assigned problem oriented to design and application issues. Graduate Staff

FOR GRADUATES ONLY

IE 608 Linear Programming Applications. 3(3-0) S,Alt. years.

IE 611 The Design of Production Systems. 3(3-0) F, Alt. years.

IE 622 Inventory Control Methods II. 3(3-0) F.

IE (PSY) 640 Skilled Operator Performance. 3(3-0) F Alt. years.

IE 641 Environmental Factors and Human Performance. 3(3-0) S.

IE 651 Special Studies in Industrial Engineering. Credits Arranged.

IE (MA, OR) 692 Special Topics in Mathematical Programming. 3(3-0) F,S,Sum.

IE 693 Seminar in Systems Safety Engineering. 1(1-0) S.

IE 694 Advanced Problems in Human Factors Engineering. 3(3-0) S.

IE 695 Seminar. 1(1-0) F,S.

IE 699 Industrial Engineering Research. Credits Arranged.

International Student Orientation

ISO 100 International Student Orientation. 1(1-0) F,S. Required of all foreign students new to the United States. Aims to acquaint them with the Raleigh community, American culture, University academic procedures and U.S. Government regulations. Undergraduates enroll for credit; graduates, for audit. Weaver

Landscape Architecture

LAR 211 Introduction to Landscape Architecture. Preq: Not open to students in Design. 3(3-0) F,S. An overview of the landscape architectural discipline for non-design majors. Includes development of the role of the landscape professional as a change agent in the environment. Gumz

LAR 212 Scope of Landscape Architecture. 3(3-0) S. Introductory seminar for majors. Explores the changing nature of the profession and professional practice and examines the emerging values, theories, methods, and techniques of landscape architecture. Staff

LAR 321, 322 Landscape Materials I, II. Preq: Science electives. 3(1-4) F,S. Professional option for students concentrating on small-scale physical design. Identification and properties of materials. Exercises stress implementation and use of materials for particular situations. Staff

LAR 400 Intermediate Landscape Architecture Design (Series). Preq: DN 202 or equivalent or consent of department. 4(1-9) F,S. Courses cover small-scale design, urban landscape architecture, public and institutional design. Each course conducted as a workshop/studio to study the problems of project organization, design and execution. The course may be scheduled four times. Staff

LAR 410 Site Planning. Preqs: LAR 212 and GY 120/GY 110 or GY 101/GY 110 or SSC 205. 3(2-2) F. Introduction to technical operations and environmental landscape controls on project scale developments. Site analysis, road alignment, grading, hydrologic control, sedimentation control, related problems of land development. Staff

LAR 411 Natural Environment Analysis in Design. Preqs: LAR 410, Science electives or CI. 3(2-3) F. Theory and methods of landscape description, assessment and analysis of natural environments. Environmental science applications described in relationship to land planning and management. Staff

LAR 412 Social Factors Analysis in Design. Preq: LAR 212 or CI. 3(2-4) S. Introduction to human analysis techniques which can be applied to landscape architectural design. Interaction theory, neighborhood theory, social design policy, and user preference approaches. Staff

LAR 491 Special Projects in Landscape Architecture. Preqs: Sr. standing and 3.0 G.P.A. 2-4 F,S. Intended as a special projects framework for advanced undergraduates to do research on a tutorial basis. The course may be scheduled twice.
Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

LAR 503 Regional Design Workshop I. Preq: Grad. standing. 3(0-9) F,S. Current literature in regional design and planning with emphasis on extracting a number of premises, theoretical structures, and information handling techniques as a basis for seminar discussions and activities. Graduate Staff

LAR 504 Regional Design Workshop II. Preq: Grad. standing. 3(0-9) F,S. Case-study projects designed to explore the relationship between the resource base and development intentions. Problem situations developed from differing viewpoints and levels of complexity. Graduate Staff

LAR 511 Social Design Policy. Preq: Grad. standing. 3(1-2) F. Explores theory and practices of the social policy impact on the designed environment and the users of that environment. The public community development process is studied as it relates to the built environment. Graduate Staff

LAR 512 Landscape Resource Management. Preq: LAR 411 or CI. 3(1-4) S. Laboratory techniques in methodology of analysis and management of natural resources related to landscape architecture. Case-study approaches using spatial mapping and analysis techniques are stressed. Graduate Staff

LAR 521 Values, Theory, and Methods of Landscape Architecture. Preq: Grad. standing. 3(3-0) F. Regional analysis, landscape assessment, land development, urban planning, recreation planning, etc., are new and emerging roles for the landscape architect. Course develops core values and theories from which each have emerged and surveys techniques and methods of development.
Graduate Staff

LAR 591, 592 Special Projects. Preq: Grad. standing. 4(2-6) F,S. Student-evolved projects emphasizing utilization and expansion of technical processes and techniques to reinforce design solutions. Open to graduate students in related fields. Graduate Staff

FOR GRADUATES ONLY

LAR 603 Regional Design III. 3(0-9) F.

LAR 604 Regional Design IV. 3-6 S.

LAR 612 Social Factors Analysis in Design. 3(2-1) S.

LAR 691 Degree Seminar. 0

LAR 698 Advanced Research Projects. 2-6 F,S.

Liberal Arts

LA (ALS) 490 International Seminar. 1(1-0) S. (See agriculture and life sciences, page 199.)

Marine Sciences

FOR ADVANCED UNDERGRADUATES

MAS (OY) 200 Introduction to the Marine Environment. Preq: High school physics, chemistry, algebra, trigonometry and biology or equivalent. 3(3-0) F,S. The ocean as a part of our environment including interactions between atmosphere and ocean, ocean circulation, physical and chemical properties of sea water, marine geology and marine biology.

MAS (MAE) 471 Undersea Vehicle Design. 3(3-0) F,S. (See mechanical and aerospace engineering, page 311.)

MAS (CE, OY) 487 Physical Oceanography. 3(3-0) S. (See physical oceanography, page 335.)

FOR GRADUATES AND ADVANCED UNDERGRADUATES

MAS (ZO) 529 Biological Oceanography. 3(3-0) S. (See zoology, page 389.)

MAS (OY, CE) 541 Gravity Wave Theory I. Preq: ESM 303 or PY 411. 3(3-0) S. Emphasis on basic mechanics of wave motions, mass transport induced by waves and various conservation laws with their applications in wave study.

MAS (OY) 551 Ocean Circulation. Preq: ESM 303 or PY 411. 3(3-0) S. The mechanics of ocean circulation with emphasis on various simple models of circulation systems.

MAS (CE) 581 Introduction to Oceanographic Engineering. 3(3-0) S. (See civil engineering, page 225.)

MAS (GY) 584 Marine Geology. 3(3-0) S. (See geology, page 278.)

MAS 591, 592 Marine Sciences Seminar. 1(1-0) F,S. Seminar gives perspective in the field of oceanology; topics vary. In order to obtain credit a student must deliver a seminar.

FOR GRADUATES ONLY

MAS (OY) 601 Advanced Physical Oceanography I. 3(3-0) F.

MAS (OY) 602 Advanced Physical Oceanography II. 3(3-0) S.

MAS (OY, ESM) 605 Advanced Geophysical Fluid Mechanics I. 3(3-0) F.

MAS (OY, ESM) 606 Advanced Geophysical Fluid Mechanics II. 3(3-0) S.

MAS (OY, ESM) 613 Perturbation Method in Fluid Mechanics I. 3(3-0) F.

MAS (OY, ESM) 614 Perturbation Method in Fluid Mechanics II. 3(3-0) S.

MAS 693 Special Topics in Marine Sciences. 1-3.

MAS (OY) 699 Research in Physical Oceanography. Credits Arranged. F,S.

Materials Engineering

FOR UNDERGRADUATES

MAT 200 Mechanical Properties of Structural Materials. Preqs: CH 105 and the first course in ESM. 2(1-3) F,S. The dependence of mechanical properties of structural materials on macro-, micro- and crystalline structure; control of structure through treatment.

MAT 201 Structure and Properties of Engineering Materials. Preq: CH 105. 3(2-3) F,S. The fundamental physical principles governing the structure and constitution of metallic and nonmetallic materials of construction, and the relation of these principles to the control of properties.

MAT 301 Equilibrium and Rate Processes in Materials Science. Preq: CH 331 or equivalent. 3(3-0) S. Application of thermodynamic and kinetic principles to engineering materials in the liquid and solid states.

MAT 310 Physical Examination of Materials. Preq: MAT 201. 3(1-6) F. Experiments demonstrate basic techniques in crystallography, x ray diffraction, optical and electron microscopy, and thermal analysis.

MAT 311 Ceramic Processing I. Preq: MAT 201. 4(3-3) F. The basic chemical and physical laws underlying the processes and behavior of diverse ceramic compositions in the sequential manufacturing operations required to produce ceramic materials with controlled properties.

MAT 312 Ceramic Processing II. Preq: MAT 311. 3(3-0) S. Basic principles underlying the thermal processing of ceramics. Appropriate subject materials in basic and engineering sciences with particular reference to obtaining desired microstructures.

MAT 400 Metallic Materials in Engineering Design. Preq: MAT 200 or 201. 3(3-0) F,S. Relationship of microstructure to the properties of materials. Control of microstructure to meet engineering design requirements.

MAT 401 Materials Processing. Preqs: MAT 301, 450, 412. 3(3-0) F. Techniques for the processing of ceramic, metallic and polymeric materials to control properties, form, and appearance through considerations of thermal, chemical, mechanical, electrical, magnetic and nuclear energy. Both traditional and exotic processes are covered utilizing fundamental materials science and engineering science principles.

MAT 411, 412 Physical Principles in Materials Science I, II. Preqs: (411) MAT 201; (412) MAT 411. 3(3-0) F,S. Fundamental physical concepts of ceramic, metallic and polymeric materials. Relation between properties and structure.

MAT 417 Ceramic Subsystem Design. Preq: MAT 312. 3(2-3) S. Individual and team study involving the interdependence of plant layout, processes, equipment and materials in the economic design of engineering systems and subsystems. Discussion of design principles, sources of data, creativity and economic analysis to encourage original solutions to engineering problems.

MAT 423, 424 Materials Factors in Design I, II. Preqs: (423) MAT 450: (424) MAT 423. Coreq: (423) MAT 431. 3(3-0) F,S. Selection of materials for specific engineering applications. Manufacturing processes and their relation to product use.

MAT 431, 432 Physical Metallurgy I, II. Preqs: (431) MAT 412; (432) MAT 431. 3(3-0) F,S. Alloy design; control of properties through microstructures; principles of heat treatment; strengthening mechanisms.

MAT 435, 436 Physical Ceramics I, II. Preqs: (435) MAT 412; (436) MAT 435. (435) 3(3-0) F; (436) 3(2-3) S. The physicochemical nature of classical and newly discovered ceramic materials. The first course emphasizes the thermodynamics, crystal structure, structural imperfections and non-stoichiometry of ceramic compounds coupled with phase equilibria. The effects of these parameters on properties. The second course is a detailed study of the thermal, mechanical, electrical and electronic properties of these materials.

MAT 437 Introduction to the Vitreous State. Preq: MAT 301. 3(3-0) S. The formation, structure, physical and chemical modifications of vitreous systems. Practical industrial calculations and the fabrication of glass. Catalyzed nucleation and crystallization of glasses in relation to physical properties.

MAT 450 Mechanical Properties of Materials. Preqs: MAT 201 and ESM 205. 3(3-0) S. Elastic, plastic, and fracture phenomena in solids including yielding, strain hardening, brittle fracture, creep and fatigue.

MAT 491 Materials Engineering Seminar. Preq: Sr. standing. 1(1-0) F,S. Literature survey of selected MAT topics. Oral and written reports and discussions.

MAT 493, 494 Ceramic Field Exercises I, II. Preq: Sr. standing. 1(0-3) F,S. Plant visitations, lectures by practicing ceramic engineers, reports on industrial organizations engaged in manufacture or use of ceramics. Discussions of professional organizations and ethics.

MAT 495 Materials Engineering Projects. Preq: Jr. or sr. standing. 1-6 F,S. Advanced engineering principles applied to a specific project dealing with metallurgy, materials or general experimental work. A seminar period is provided and a written report required.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

MAT 500 Modern Concepts in Materials Science. Preq: MAT 412. 3(3-0) F. Applications of current theories such as crystal theory, continuum and quasi-continuum theories, phenomenological theories, etc., to the solution of materials problems.

MAT 503 Ceramic Microscopy. Preq: GY 331. 3(2-3) F. Transmitted and reflected light techniques for the systematic study of ceramic materials and products.

MAT 509 High Vacuum Technology. Preq: CH 433 or MAE 301. 3(2-3) F,S. Properties of low-pressure gases and vapors. Production, maintenance and measurement of high vacuum; design, construction and operation of high vacuum high temperature facilities. Properties and reactions of materials which are processed, tested and/or utilized in high vacuum environments.

MAT 510 Structure of Crystalline Materials. Preq: MAT 411; Coreq: MAT 500. 3(3-0) F. The lattice structure of crystals, including group theory applications, reciprocal lattice concept and crystal structure as related to bonding.

MAT 520 Theory and Structure of Materials. Preq: MAT 510. 3(3-0) S. Structure of liquids, and crystalline and amorphous solids used in engineering systems. Crystallinity and thermal properties. Ionic crystals in ceramic systems. The metallic state and alloy behavior. Emphasis on the relation between fundamental materials parameters and engineering properties.

MAT 527 Refractories in Service. Preq: MAT 411. 3(3-0) S. The physical and chemical properties of the more important refractories in their environment in industrial and laboratory furnaces.

MAT 529 Properties of High Temperature Materials. Preq: MAT 201 and MAE 301. 3(3-0) S. Effects of temperature on the physical, mechanical and chemical properties of inorganic materials; relationships between microstructure and high temperature properties; applications of ceramics, metals and composites at elevated temperatures.

MAT 530 Phase Transformations in Materials I. Coreq: MAT 500. 3(3-0) S. Kinetic theory of transformations, nucleation theory, homogenous and heterogeneous nucleation, growth of crystals, epitaxial thin films.

MAT 533, 534 Advanced Ceramic Engineering Design I, II. Preq: MAT 417. 3(2-3) F,S. Analysis and design of ceramic products, processes and systems leading to original solutions of current industrial problems and the development of new concepts of manufacturing.

MAT 540 Glass Technology. Preq: MAT 437. 3(3-0) F. Fundamentals of glass manufacture including compositions, properites and application of the principal types of commercial glasses.

MAT 541, 542 Principles of Corrosion I, II. Preq: MAT 201 or CH 431 or MAE 301. 3(2-3) F,S. Fundamentals of metallic corrosion and passivity. The electro-chemical nature of corrosive attack, basic forms of corrosion, corrosion rate factors, methods of corrosion protection. Laboratory work.

MAT 550 Dislocation Theory. Preq: MAT 450. 3(3-0) F. Structure, energetics, stress and strain fields, interactions and motion of dislocations in solids.

MAT 556 Composite Materials. Preq: MAT 450. 3(3-0) F. Basic principles underlying composite materials properties as related to individual constituents properties and their interactions. Emphasis on the design of composite systems to yield desired combinations of properties.

MAT (NE) 562 Materials Problems in Nuclear Engineering. Preq: Advanced undergraduate standing. 3(3-0) F. Reactor design and operating considerations determined by materials properties. The interrelations among materials compatibility effects, corrosion effects and radiation effects in fission and fusion reactors.

MAT (NE) 573 Computer Experiments in Materials and Nuclear Engineering. Preq: Advanced undergraduate standing. 3(3-0) F. How to design and use Monte Carlo and dynamical computer experiments.

MAT 595 Advanced Materials Experiments. Preq: Sr. or grad. standing. 1-3. Advanced engineering principles applied to a specific experimental project dealing with materials. A seminar period provided. Written report required.

FOR GRADUATES ONLY

MAT 601 Ceramic Phase Relationships. 3(3-0) S.

MAT 603 Advanced Ceramic Reaction Kinetics. 3(3-0) S.

MAT 610 X Ray Diffraction. 3(3-0) F.

MAT 615 Electron Microscopy. 3(3-0) F.

MAT 621 Theory and Structure of Amorphous Materials. 3(3-0) S.

MAT 622 Theory and Structure of Ceramic Materials. 3(3-0) F.

MAT 623 Theory and Structure of Metallic Materials. 3(3-0) F.

MAT 630 Phase Transformation in Materials II.3(3-0) F.

MAT 631, 632 Advanced Physical Ceramics I, II. 3(2-3) F,S.

MAT 633 Advanced Mechanical Properties of Materials. 3(3-0) F.

MAT 661 Diffraction Theory. 3(3-0) F.

MAT 691, 692 Special Topics in Materials Engineering. 1-3 F,S.

MAT 695 Materials Engineering Seminar. 1(1-0) F,S.

MAT 699 Materials Engineering Research. Credits Arranged F,S.

Mathematics

MA 102 Analytic Geometry and Calculus I. Preq: MA 111 or equivalent completed in high school. Credit in both MA 102 and MA 112 is not allowed. 4(3-2) F,S. First of three semesters of unified analytic geometry and calculus course. Functions and graphs, limits, derivatives of algebraic functions and applications, indefinite integral, definite integral and the fundamental theorem of calculus, areas and volumes, plane analytic geometry.

MA 111 Algebra and Trigonometry. 4(3-2) F,S. Sets and logic, the real number system, polynomials, algebraic fractions, exponents and radicals, linear and quadratic equations, inequalities, functions and relations, logarithms, plane trigonometry. (Students in Engineering, Physical and Mathematical Sciences, Design, Agricultural Engineering and Mathematics Education who are required to take this course will not receive credit hours for MA 111 toward graduation requirements.)

MA 112 Analytic Geometry and Calculus A. Preq: MA 111. Credit in both MA 102 and MA 112 is not allowed. 4(4-0) F,S. Limits and derivatives, techniques of differentiation, applications, logarithmic and exponential functions, higher derivatives, definite integral, applications, integration techniques, multivariate calculus, partial derivatives, multiple integrals, examples and applications in biological and behavioral sciences.

MA 114 Topics in Modern Mathematics. Preq: MA 111 or equivalent completed in high school. 3(3-0) F,S. Addition and multiplication of matrices, linear equations, linear dependence and vector spaces, linear inequalities and linear programming, binary relations, eigenvalues, quadratic forms, finite Markov chains. Examples and applications in biological and behavioral sciences.

MA 115 Introduction to Contemporary Mathematics I. Credit in MA 115 is not allowed if student already has credit in MA 102, MA 112 or MA 114. 3(3-0) F,S. The number system and other scales of notation; algebraic operations; inequalities; sets, logic and Boolean algebra; logarithmic and trigonometric functions. The point of view is intuitive.

MA 116 Introduction to Contemporary Mathematics II. Preq: MA 115. Credit in MA 116 is not allowed if student already has credit in MA 102, MA 112 or MA 114. 3(3-0) F,S. Permutations, combinations and the binomial theorems; probability;

mathematical induction; the group as an example of a finite mathematical system; graphs of systems of linear inequalities and linear programming; solutions of linear systems by Cramer's rule and matrix methods; introduction to analytic geometry and calculus.

MA 122 Mathematics of Finance and Elementary Statistics. Preq: MA 111 or 115. 4(3-2) F,S. Simple and compound interest, annuities and their application to amortization and sinking fund problems, installment buying, calculation of premiums of life annuities and life insurance, elementary statistics.

MA 127 Recreational Mathematics. Preq: MA 111 or 115. 3(3-0) S. Requires only algebra and trigonometry, but student engages in new type of mathematical thought. Games and puzzles, tricks, geometric figures, model building, fallacies, paradoxes, curiosities, anecdotes, conjectures, famous problems, mathematical humor and more. Mathematical treatments involve number theory, set theory, algebra, topology, combinatorics, geometry, probability, analysis, computer science, math history.

MA 201 Analytic Geometry and Calculus II. Preq: MA 102. 4(4-0) F,S. Second of three semesters of unified analytic geometry and calculus course. Applications of definite integral. Transcendental functions, methods of integration, polar coordinates, parametric equations, introduction to infinite series.

MA 202 Analytic Geometry and Calculus III. Preq: MA 201. 4(4-0) F,S. Third of three semesters of unified analytic geometry and calculus course. Brief introduction to determinants and matrices, vector functions, analytic geometry of three dimensions and partial differentiation, multiple integration, applications. Line integral and Green's Theorem.

MA 212 Analytic Geometry and Calculus B. Preq: MA 112. 3(3-0) F,S. Sequences, series, Taylor's Theorem, trigonometric functions, difference equations, differential equations, examples and applications in biological and behavioral sciences.

MA 214 Elementary Probability. Preq: MA 112 or 102. 3(3-0) S. Basic concepts, elementary counting procedures, conditional probability, discrete random variables, infinite sample spaces, continuous random variables, continuous time stochastic processes, examples and applications in biological and behavioral sciences.

MA 231 Introduction to Linear Algebra. Preq: MA 201. 4(4-0) F,S. Vectors and vector spaces, linear transformations, linear equations, determinants, eigenvalues and quadratic forms.

MA 232 Introduction to Multivariable Calculus. Preq: MA 231. 3(3-0) F,S. Functions of several variables, limits, continuity, differentiability, chain rule, implicit functions, multiple integrals.

MA 301 Applied Differential Equations I. Preq: MA 202 or equivalent. 3(3-0) F,S. First order equations, applications, linear equations of higher order, applications to mechanical and electrical systems, series solutions, special functions, Laplace transforms.

MA 312 Introduction to Differential Equations. Preq: MA 231, 201. 3(3-0) F,S. First order differential equations, basic theory and applications of linear equations. Systems of linear equations, matrix methods, series solutions, Laplace transforms, existence and uniqueness.

FOR ADVANCED UNDERGRADUATES

MA 401 Applied Differential Equations II. Preq: MA 301 or 312. 3(3-0) F,S. The wave, heat and Laplace equations. Solutions by separation of variables and expansion in Fourier Series or other appropriate orthogonal sets.

MA 403 Introduction to Modern Algebra. Preq: One year of calculus. 3(3-0) F,S. Sets and mappings; equivalence relations; groups, homomorphisms, cosets, Cayley's Theorem, symmetric groups, quotient groups, rings, integral domains; Euclidean algorithms, polynomial rings, ideals, quotient rings.

MA 404 Affine and Projective Geometry. Preq: MA 231 and 403. 3(3-0) S. Introduction to geometry of Euclidean, affine and projective spaces with emphasis on important groups of symmetrics of these spaces.

MA 405 Introduction to Matrices and Linear Transformations. Preq: One year of calculus. 3(3-0) F,S. Determinants, linear equations, linear tranformations and matrices, operations with matrices, eigenvalues, introduction to bilinear and quadratic forms.

MA 408 Foundations of Euclidean Geometry. Preq: MA 403. 3(3-0) F. A critique of Euclid's Elements, incidence and order properties, congruence of triangles, absolute and non-Euclidean geometry, the parallel postulate, real numbers and geometry.

MA 410 Theory of Numbers. Preq: One year of calculus. 3(3-0) F,S. Concerned with investigation of arithmetic properties of the integers. Congruences, arithmetic functions, quadratic residues, the quadratic reciprocity Law of Gauss, primitive roots, diophantine equations, and algebraic number fields.

MA 421 Introduction to Probability. Preq: One year of calculus. 3(3-0) F,S. Axioms of probability, conditional probability, combinatorial analysis, random variables, expectation, simple stochastic processes.

MA 425 Mathematical Analysis I. Preq: MA 232. 3(3-0) F. Real number system, functions and limits, topology on the real line, continuity, differential and integral calculus for functions of one variable.

MA 426 Mathematical Analysis II. Preq: MA 425. 3(3-0) S. Infinite series, uniform convergence, calculus of several variables, topology in n-dimensions, limits, continuity, differentiability, implicit functions, multiple integrals, line and surface integrals.

MA (CSC) 427 Introduction to Numerical Analysis I. Preq: MA 301 or 312. Knowledge of a programming language. 3(3-0) F. Designed for undergraduate students in any department who wish knowledge of theory and practice of computational procedure using a digital computer. Approximation of functions by interpolating polynomials. Numerical differentiation and integration. Solution of systems of ordinary differential equations both initial value and boundary value problem. Computer applications and techniques stressed.

MA (CSC) 428 Introduction to Numerical Analysis II. Preq: MA 231 or 405. Knowledge of a programming language. 3(3-0) S. Designed for students who wish knowledge of computational procedures using digital computers. Solution of linear and nonlinear equations. Matrices and eigenvalue calculations. Orthogonal poly-

nomials and Gaussian quadrature. Curve fitting and function approximation by least squares. Smoothing formulas. Minimax approximations. CSC(MA) 427 is not a prerequisite for this course.

MA 430 Introduction to Applied Mathematics. Coreq: MA 426, 421 or 214. 3(3-0) F. Formulation of scientific problems in mathematics terms, interpolation and evaluation of the solution. Topics discussed chosen from problems in managerial, behavior and life sciences as well as physical sciences.

MA 433 History of Mathematics. Preq: One year of calculus. 3(3-0) S. Development of mathematical thought and evolution of mathematical ideas examined in a historical setting. Biographical and historical content supplemented and reinforced by study of techniques and procedures used in earlier eras.

MA 491 Reading in Honors Mathematics. Preq: Membership in honors program, consent of department. 2-6 F,S.

MA 493 Special Topics in Mathematics. Preq: Consent of department. 1-6 F,S.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

MA (NE) 504 Mathematical Methods in Engineering. Preq: MA 301 or 312. 3(3-0) F. Topics include ordinary differential equations, matrices, partial differential equations, difference equations, numerical methods, elements of statistics, Techniques and applications to engineering are stressed. Course cannot be taken for credit by mathematics majors.

MA (IE, OR) 505 Mathematical Programming I. (See industrial engineering, page 293.) 3(3-0) F,Sum.

MA 511 Advanced Calculus I. Preq: MA 301 or 312. 3(3-0) F,S. Fundamental theorems on continuous functions, convergence theory of sequences, series and integrals; the Riemann integral.

MA 512 Advanced Calculus II. Preq: MA 301 or 312. 3(3-0) F,S. General theorems of partial differentiation; implicit function theorems; vector calculus in 3-space; line and surface integrals; classical integral theorems.

MA 513 Introduction to Complex Variables. Preq: MA 511 or 425. 3(3-0) F,S. Operations with complex numbers, derivatives, analytic functions, integrals, definitions and properties of elementary functions, multivalued functions, power series, residue theory and applications, conformal mapping.

MA 514 Methods of Applied Mathematics. Preq: MA 511 or 425. 3(3-0) S. Introduction to integral equations, the calculus of variations and difference equations.

MA 515 Linear Functional Analysis I. Preq: MA 426. 3(3-0) F. Metric spaces; Lebesgue measure and integration; L^p and ℓ^p spaces; Reisz-Fischer and Reisz representation theorems; normed linear spaces and Hilbert spaces.

MA 516 Linear Functional Analysis II. Preq: MA 515. 3(3-0) S. Basic theorems in Banach spaces, dual spaces, weak topologies; basic theorems in Hilbert spaces, and detailed theory of linear operators on Hilbert spaces; spectral theorem for self-adjoint completely continuous linear operators.

MA 517 Introduction to Topology. Preq: MA 426. 3(3-0) F,S. Sets and functions, metric spaces, topological spaces, compactness, separation, connectedness.

MA 518 Calculus on Manifolds. Preq: MA 426. 3(3-0) S. Calculus of several variables from a modern viewpoint. Differential and integral calculus of several variables, vector functions, integration on manifolds, Stoke's and Green's Theorems, vector analysis.

MA 520 Linear Algebra. Preq: MA 231 or 405. 3(3-0) F,S. Vector spaces, linear mappings and matrices, determinants, inner product spaces, bilinear and quadratic forms, canonical forms, spectral theorem.

MA 521 Fundamentals of Modern Algebra. Preq: MA 403 and 520. 3(3-0) S. Groups, normal subgroups, quotient groups, Cayley's Theorem, Sylow's Theorem. Rings, ideals and quotient rings, polynomial rings. Fields, extension fields, elements of Galois theory.

MA 523 Topics in Applied Mathematics. Coreq: MA 515, 520. 3(3-0) F. Formulation of scientific problems in mathematical terms, interpretation and evaluation of the mathematical analysis of the resulting models. Problems in behavioral and biological sciences and in mechanics of discrete and continuous systems. Discussions of optimization and the calculus of variations.

MA 524 Mathematical Methods in the Physical Sciences I. Preqs: MA 405, 512. 3(3-0) F. Green's functions and two point boundary value problems; elementary theory of distributions; generalized Green's functions. Finite and infinite dimensional inner product spaces; Hilbert spaces; completely continuous operators; integral equations; the Fredholm alternative; eigenfunction expansions; applications to potential theory. Nonsingular and singular Sturm-Liouville problems; Weil's Theorem.

MA 525 Mathematical Methods in the Physical Sciences II. Preq: MA 524. 3(3-0) S. Distribution theory in n-spaces; Fourier transforms; partial differential equations, generalized solutions, fundamental solutions, Cauchy problem, wave and heat equations, well-set problems, Laplace's equations, the Dirichlet and Neumann problems, integral equations of potential theory, Green's functions, eigenfunction expansions.

MA (CSC) 529 Numerical Analysis I. Preqs: MA 511 or equivalent, MA 231 or 405. 3(3-0) F. For graduate and advanced undergraduate students who wish to learn the theory of numerical analysis of systems of linear equations, solutions to nonlinear equations, interpolation theory, and divided differences. Understanding theory behind the various techniques and their error estimates. Illustrations of use and limitations of these methods on the computer.

MA (CSC) 530 Numerical Analysis II. Preq: MA (CSC) 529. 3(3-0) S. Continuation of CSC (MA) 529. Numerical integration, numerical solutions of ordinary differential equations, and numerical solutions of partial differential equations.

MA 532 Theory of Ordinary Differential Equations. Preqs: MA 301 or 312, MA 405, advanced calculus. 3(3-0) S. Existence and uniqueness theorems, systems of linear equations, fundamental matrices, matrix exponential, series solutions, regular singular points; plane autonomous systems, stability theory.

MA (CSC) 536 Theory of Sequential Machines. Preq: CSC 412 or grad. standing. 3(3-0) F. Sequential machine identification experiments. Finite-Memory machines. Special classes of machines. Decomposition of sequential machines. Linear sequential machines. Sequential relations of finite-state machines.

MA (CSC) 537 Theory of Computability. Preq: CSC 412 or grad. standing. 3(3-0) S. Turing Machines. Primitive recursion functions. The μ-operator. μ-recursive functions. Godel numbering. Equivalence of Turing Machines and μ-recursion. Undecidable predicates. Universal Turing Machines. Other formulations of effective computability.

MA (ST) 541 Theory of Probability I. Preq: MA 425 or 511. 3(3-0) F. Axioms, combinatorial analysis, conditional probability, independence random variables, expectation, special discrete and continuous distributions, probability and moment generating functions, central limit theorem, laws of large numbers, branching processes, recurrent events, random walk.

MA (ST) 542 Theory of Probability II. Preqs: MA 504, 541. 3(3-0) S. Markov chains and Markov processes, Poisson process, birth and death processes, queueing theory, renewal theory, stationary processes, Brownian motion.

MA 545 Set Theory and Foundations of Mathematics. Preq: MA 403. 3(3-0) S. Logic and the axiomatic approach, the Zermelo-Fraenkel axioms and other systems, algebra of sets and order relations, equivalence of the Axiom of Choice, one-to-one correspondences, cardinal and ordinal numbers, the Continuum Hypothesis.

MA (PY) 555 Mathematical Introduction to Celestial Mechanics. Preq: One year of advanced calculus. 3(3-0) F. Central orbits, N-body problems, 3-body problem, Hamilton-Jacobi theory, perturbation theory, applications to motion of celestial bodies.

MA (PY) 556 Orbital Mechanics. Preqs: MA 301, 405, or knowledge of elementary mechanics and computer programming. 3(3-0) S. Keplerion motion, iterative solutions, numerical integration, differential corrections and space navigation, elements of probability, least squares, sequestial estimation, Kalman fields.

MA (BMA, ST) 571 Biomathematics I. 3(3-0) F. (See biomathematics, page 210.)

MA (BMA, ST) 572 Biomathematics II. 3(3-0) S. (See biomathematics, page 210.)

MA 581 Special Topics. Preq: Consent of department. 1-6 F,S.

MA (CSC) 582 Special Topics in Numerical Solution of Linear Algebraic Equations. Preq: MA 405 or equivalent and a knowledge of computer programming. 3(3-0) S. A mathematical and numerical investigation of direct iterative and semi-iterative methods. Methods for the calculation of eigenvalues and eigenvectors of matrices.

MA (CSC) 583 Special Topics in the Numerical Solution of Ordinary Differential Equations. Preq: Knowledge to the level of CSC 427. 3(3-0) S. Numerical methods for initial value problems including predictor-corrector, Runge-Kutta, hybrid and extrapolation methods; stiff systems; shooting methods for two point boundary value problems; weak, absolute and relative stability results.

MA (CSC) 584 Special Topics in the Numerical Solution of Partial Differential Equations. Preq: Knowledge to the level of CSC 427-428. 3(3-0) F. Numerical methods for the solutions of parabolic, elliptic, and hyperbolic partial differential equations including stability and convergence results.

FOR GRADUATES ONLY

MA 600 Advanced Differential Equations I. 3(3-0) F.

MA 601 Advanced Differential Equations II. 3(3-0) S.

MA 602 Partial Differential Equations I. 3(3-0) F.

MA 603 Partial Differential Equations II. 3(3-0) S.

MA 604 Topology. 3(3-0) S.

MA 605 Homology and Manifolds. 3(3-0) F.

MA (ST, OR) 606 Mathematical Programming II. 3(3-0) S.

MA 611 Analytic Function Theory I. 3(3-0) F,S.

MA 612 Analytic Function Theory II. 3(3-0) F,S.

MA 613 Techniques of Complex Analysis. 3(3-0) S.

MA 615 Theory of Functions of a Real Variable. 3(3-0) F.

MA (ST) 617 Measure Theory and Advanced Probability. 3(3-0) F.

MA (ST) 618 Measure Theory and Advanced Probability. 3(3-0) S.

MA (ST) 619 Topics in Advanced Probability. 3(3-0) Sum.

MA 620 Modern Algebra I. 3(3-0) F.

MA 621 Modern Algebra II. 3(3-0) S.

MA 622 Linear Transformations and Matrix Theory. 3(3-0) F.

MA 623 Theory of Matrices and Applications. 3(3-0) S.

MA 626 Algebraic Topology. 3(3-0) S.

MA 628 General Topology. 3(3-0) S.

MA 632 Operational Mathematics I. 3(3-0) F.

MA 633 Operational Mathematics II. 3(3-0) S.

MA 634 Theory of Distributions. 3(3-0) F.

MA (CSC) 635 Functional Analysis and Numerical Analysis. 3(3-0) S.

MA 637 Differentiable Manifolds. 3(3-0) F.

MA 641 Calculus of Variations and Theory of Optimal Control I. 3(3-0) F.

MA 642 Calculus of Variations and Theory of Optimal Control II. 3(3-0) S.

MA 647 Functional Analysis I. 3(3-0) F.

MA 648 Functional Analysis II. 3(3-0) S.

MA 661 Differential Geometry and Tensor Analysis I. 3(3-0) F.

MA 662 Differential Geometry and Tensor Analysis II. 3(3-0) S.

MA 681 Special Topics in Real Analysis. 1 to 6

MA 682 Special Topics in Complex Analysis. 1 to 6

MA 683 Special Topics in Algebra. 1 to 6

MA 684 Special Topics in Combinatorial Analysis. 1 to 6

MA 685 Special Topics in Numerical Analysis. 1 to 6

MA 686 Special Topics in Topology. 1 to 6

MA 687 Special Topics in Geometry. 1 to 6

MA 688 Special Topics in Differential Equations. 1 to 6

MA 689 Special Topics in Applied Mathematics. 1 to 6

MA (IE, OR) 692 Special Topics in Mathematical Programming. 3(3-0) F,S,Sum.

MA 699 Research. Credits Arranged.

Mechanical and Aerospace Engineering

MAE 200 Mechanical Technology in Contemporary Society. 3(3-0) F,S. The role of mechanical and aerospace engineering in our present technological society with approaches used by engineers in solving problems. Topics include: power generation, modern flight, and transportation vehicles.

MAE 216 Elements of Mechanical Engineering. Preq: ESM 205, PY 208 or 202. 3(3-0) S. An introduction to mechanical engineering emphasizing the application and extension of chemistry, physics and mathematics to real engineering problems in analysis and design.

MAE 250 Introduction to Aerospace Engineering. Preq: PY 205. 3(3-0) S. An introductory study of the aerodynamics, structural, propulsion, performance and control requirements of flight vehicles.

MAE 301 Engineering Thermodynamics I. Preqs: MA 202, PY 208 or 202. 3(3-0)) F,S. Energy and the laws governing the transfers and transformations of energy. Emphasis is on thermodynamic properties and First and Second law analysis of systems. Some basic statistical thermodynamic concepts are applied to the calculation of properties.

MAE 302 Engineering Thermodynamics II. Preq: MAE 301. 3(3-0) S. Emphasis on the application of basic principles to engineering problems with systems involving mixtures of ideal gases, psychrometrics, nonideal gases, chemical reactions, combustion, chemical equilibrium, cycle analysis and one-dimensional compressible flow.

MAE 303 Engineering Thermodynamics III. Preq: MAE 301. 3(3-0) S. For nonmechanical engineering jrs. Thermodynamics of mixtures; thermodynamics of fluid flow, heat transfer, vapor and gas cycles, and applications.

MAE 305 Mechanical Engineering Laboratory I. Coreq: MAE 301. 1(0-3) F. The theory and practice of measurement and experimental data collection. Com-

ponents of the generalized measurement system and their effects on the final result. Methods of data analysis as well as basic instrumentation for sensing, conditioning and displaying experimental quantities.

MAE 306 Mechanical Engineering Laboratory II. Preqs: MAE 305, EE 331. 1(0-3) S. Specific types of measurements. Students evaluate and compare different instrumentation for measuring the same physical quantity on the basis of cost, time required, accuracy, etc.

MAE 307 Energy and Energy Transformations. Preqs: MA 201, PY 212. 3(3-0) F. Energy transformation as permitted by the First Law and limited by the Second Law. Properties of ideal gases and actual gases; properties of vapors. Vapor power cycles; vapor refrigerating cycles, gas cycles for internal combustion engines and gas turbines. Elements of heat transfer.

MAE 315 Dynamics of Machines. Preqs: MAE 216, ESM 205. 3(3-0) S. A rational application of dynamics to the analysis of machines and mechanical devices to determine the motions resulting from applied loads and the forces and inputs required to produce specified motions.

MAE 316 Strength of Mechanical Components. Preqs: ESM 205, MAT 201. 3(3-0) F. Stress, strain and deformation analysis of mechanical components and their strength determination based on material behavior under static and dynamic operating conditions. Applications to basic machine components.

MAE 355 Aerodynamics I. Preqs: MAE 250, MA 301. 4(3-3) F. Introductory concepts of perfect fluid theory and incompressible boundary layers with application to computing the aerodynamic characteristics of airfoils, wings and flight vehicle configurations.

MAE 356 Aerodynamics II. Preqs: MAE 355, 301. 4(3-3) S. Concepts of thermodynamics, compressible fluid flow and compressible boundary layers with application to computing the areodynamic characteristics of airfoils, wings and flight vehicles configurations at high speed.

MAE 361 Aerospace Vehicle Performance. Preqs: MAE 250, MA 301, ESM 305. 3(3-0) F. Applying principles of dynamics and aerodynamics to the performance of both airplanes and space vehicles. Elements of orbital mechanics and dynamics of boost into and reentry from orbit. Methods for calculating airplane performance in level, gliding and climbing flight, take-off and landing.

MAE 365 Air-Breathing Propulsion Systems. Preqs: MAE 355, 301. 4(3-3) S. One-dimensional internal flow of compressible fluids, combustion, and thermochemistry problems. Applications to air-breathing aircraft propulsion systems. Performance analysis of components and complete propulsion systems.

MAE 371 Aerospace Vehicle Structures I. Preqs: MAE 250, ESM 205. 3(3-0) S. Theory and concepts required for the analysis and design of flight vehicle structural members. Properties and selection of materials; methods of analysis for axial, torsional, flexural and transverse shear loadings of typical flight structure members.

FOR ADVANCED UNDERGRADUATES

MAE 401 Energy Conversion. Preq: MAE 302. 3(3-0) F,S. Principles of thermodynamics, fluid mechanics, heat transfer and combustion applied to power generation. Principles feasibility, and limitations of conventional and direct energy conversion methods are studied. The economics of energy conversion. Present and possible future energy sources.

MAE 402 Heat and Mass Transfer. Preqs: MAE 302, MA 301. 3(3-0) F,S. The fundamental relationships of steady and transient heat transfer by conduction, convection, radiation and during changes of phase: mass transfer by diffusion and convection, simultaneous mass and heat transfer.

MAE 403 Air Conditioning. Preq: MAE 302. 3(3-0) F. Summer and winter air conditioning including temperature, humidity, air velocity and distribution.

MAE 404 Refrigeration. Preq: MAE 302. 3(3-0) S. A thermodynamic analysis of the simple, compound, centrifugal and multiple effect compression systems, the steam jet system and the absorption system of refrigeration.

MAE 405 Mechanical Engineering Laboratory III. Preq: MAE 306. 1(0-3) F. The final undergraduate course in the mechanical laboratory sequence with case studies in experimental engineering. Opportunity to select instrumentation and design a complete experimental set up for a specific problem.

MAE 409 Particulate Control in Industrial Atmospheric Pollution. Preq: MAE 301 or equivalent. 3(3-0) F. Combustion calculations and analysis of particulate emission and gases from industrial and utility power stations burning various types of fuel. State and Federal pollution codes, requirements for compliance and enforcement. Calculations and design of industrial equipment. Utilization of waste products.

MAE 411 Machine Component Design. Preqs: MAE 315, 316. 3(3-0) F. Applying engineering and materials sciences to the analysis and design of machine components including fasteners, springs, bearings, gears, shafts, clutches, brakes, couplings, etc.

MAE 415 Mechanical Engineering Analysis. Preqs: MAE 302, 315, 316, EE 331. 3(3-0) F. A logical method of problem solving through the integration of the physical sciences, engineering sciences and mathematics. Training in methods of analysis of real mechanical engineering problems.

MAE 416 Mechanical Engineering Design. Preq: MAE 415. 4(3-2) S. Applying engineering and materials sciences to the total design of mechanical engineering components and systems. Consideration and utilization of the design process including problem definition, solution synthesis, design analysis, optimization and prototype evaluation through design project activity.

MAE 422 Direct Energy Conversion. Preqs: MAE 301, EE 202 or 332. 3(3-0) S. Theory and application of direct energy conversion methods, including magnetohydrodynamic and electrogasdynamic generators, fuel cells, and other methods of current interest. Thermodynamic analyses, device characteristics, and design considerations.

MAE 431 Thermodynamics of Fluid Flow. Preqs: MAE 301, MA 301, ESM 303. 3(3-0) S. Application of one-dimensional compressible gas dynamics and perfect gas theory to analyze nozzle and diffuser flows, normal shocks, and constant-area frictional flows with and without heat transfer.

MAE 435 Principles of Automatic Control. Preq: MA 301. 3(3-0) F,S. Study of linear feedback control systems using transfer functions. Transient and steady-state responses. Stability analysis using rootlocus and frequency response techniques (Bode plots and Nyquist diagrams). Active and passive compensation methods. Preliminary design and analysis of typical mechanical and aerospace automatic control systems.

MAE 462 Flight Vehicle Stability and Control. Preq: MAE 361. 3(3-0) F. Linearized dynamic analysis of the motion of a six degree-of-freedom flight vehicle in response to control inputs and disturbance through use of the transfer function concept. Control of dynamic behavior by vehicle design (stability derivatives) and/or flight control systems.

MAE 467 Rocket Propulsion. Preq: MAE 365. 3(3-0) F. Performance analysis and design of liquid fuel, solid fuel, nuclear and electrical rocket propulsion systems.

MAE (MAS) 4[illegible] Undersea Vehicle Design. Preq: MAE 355 or ESM 303. 3(3-0) F or S. Solution of problems encountered in the design of both submerged and semisubmerged ocean vehicles. Treatment of vehicle drag and lift, bouyancy effects, vehicle propulsion and systems integration.

MAE 472 Aerospace Vehicle Structures II. Preq: MAE 371. 4(3-3) F. A continuation of MAE 371 emphasizing specialized topics such as semi-nomocoque structures, deflection of structures, indeterminate structures, torsion analysis. Laboratory demonstration of the theory and application of resistance strain gages, load-stress-deflection tests on typical flight vehicle structure components, the determination of basic materials properties, and correlation of tests and analytical results.

MAE 474 Matrix Stress and Deformation Analysis. Preq: MAE 316 or 371 or ESM 307 or 301. 3(3-0) S. The fundamentals and application of matrix methods of stress and deformation analysis for load-carrying components typical of aerospace and mechanical engineering systems.

MAE 479 Aerospace Vehicle Design. Preqs: MAE 356, 462, 467, 472, and EE 332. 4(2-6) S. A synthesis of previously acquired theoretical and empirical knowledge and application to the design of practical aerospace vehicle systems.

MAE 492 Special Topics in Mechanical and Aerospace Engineering. 1-3 F,S. Offered as needed to present new or special MAE subject matter.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

MAE 501 Steam and Gas Turbines. Preqs: MAE 302, ESM 303 or MAE 355. 3(3-0) F or S. Fundamental analysis of the theory and design of turbomachinery flow passages; control and performance of turbomachinery; gas-turbine engine processes.

MAE 507, 508 Internal Combustion Engine Fundamentals. Preq: MAE 302. 3(3-0) F,S. Fundamentals common to internal combustion engine cycles of operation. The Otto engine; carburetion, fuel distribution, flame and spark timing, and altitude effects; the Diesel engine; injection knock, combustion, precombustion and scavenging as applied to reciprocating and rotary engines.

MAE 510 Theory of Particulate Collection in Air Pollution Control. Preq: MAE 409 or grad. standing. 3(3-0) S. Particulate matter classification and property description. The motion of particles as applied to particulate collection. Elements of aerodynamic capture of particles. Applications in filtration and liquid scrubbing. Fundamentals of acoustical, electrostatic and thermal precipitation. Samping techniques and instrumentation.

MAE 513 Vibration and Noise Control. Preq: MAE 315 or 472. 3(2-3) F. The nature and origin of vibration and noise in mechanical systems and design for their control. Source reduction, isolation, transmission, damping and acoustic shielding techniques. Laboratory demonstrations.

MAE 515 Experimental Stress Analysis. Preq: MAE 316. 3(2-3) F. Theoretical and experimental techniques of strain and stress analysis with emphasis on electrical strain gages and instrumentation, brittle coatings, grid methods and an introduction to photoelasticity. Lab. investigation and report on problem chosen by the student under the guidance of the instructor.

MAE 516 Photoelasticity. Preq: MAE 316. 3(2-3) S. Theory and experimental techniques of two- and three-dimensional photoelasticity including photoelastic coatings, photoplasticity and an application of photoelastic methods to the solution of mechanical design problems. Laboratory investigation and report of a problem chosen by the student under the guidance of the instructor.

MAE 517 Lubrication. Preq: ESM 303. 3(2-3) S. Hydrodynamic lubrication; Reynold's equation, the Sommerfield integration, effect of variable lubricant properties and energy equation for temperature rise. Properties of lubricants. Application to design of bearings. Boundary lubricants. Solid film lubrication.

MAE 518 Acoustic Radiation I. Preq: MA 301. 3(3-0) F or S. Acoustic radiation principles as related to acoustic sources and associated fields. Radiation of single sources (point, plane, line cylinder, spheres, etc.) and combinations thereof.

MAE 521 Aerothermodynamics. Preqs: MAE 301, MAE 355 or ESM 303. 3(3-0) F or S. Basic thermodynamics pertinent to gas dynamics. Detailed development of the general equations governing gas motion in differential and integral form. Simplification of the equations for specialized flow regimes. Similarity parameters. Applications to simple problems in various flow regimes.

MAE 531 Plasmagasdynamics I. Preqs: MAE 356, PY 414. 3(3-0) F or S. Basic laws governing plasma motion for dense and rarefied plasmas, hydromagnetic shocks, plasma waves and instabilities, simple engineering applications.

MAE 532 Plasmagasdynamics II. Preq: MAE 531. 3(3-0) F or S. Quantum statistics and ionization phenomena. Charged particles interactions. Transport properties in the presence of electric and magnetic fields and nonequilibrium ionization.

MAE (EE) 535 Gas Lasers. Preqs: MAE 356 or equivalent, PY 407. 3(3-0) F or S. The principles, design and potential applications of ion, molecular, chemical and atomic gas lasers.

MAE 541, 542 Aerodynamic Heating. Preqs: MA 511, MAE 521. 3(3-0) F,S. Latest theoretical and experimental findings of the compressible laminar and turbulent boundary layers especially the aerodynamic heating problem. Analysis and design of aerospace hardware.

MAE 543 Heat Transfer—Theories and Applications. Preq: MAE 402 or equivalent. 3(3-0) F or S. Development of basic equations for steady and transient heat and mass transfer processes. Emphasis on applications of basic equations to engineering problems in the areas of conduction, convection, mass transfer and thermal radiation.

MAE 545, 546 Project Work in Mechanical Engineering I, II. 2(0-4) F,S. Indidual or small group investigation of a problem of current interest.

MAE 550 Cryogenics I. Preq: MAE 402. 3(3-0) F or S. The thermodynamic processes required to produce cryogenic fluids. Properties of materials at cryogenic temperatures. Insulation of cryogenic vessels and lines. Design of cryogenic systems.

MAE 554 Advanced Aerodynamic Theory. Preq: MAE 355. 3(3-0) S. Development of fundamental aerodynamic theory including derivation of equations of motion, airfoil theory and comparison with experimental results.

MAE 555 Advanced Flight Vehicle Stability and Control. Preq: MAE 462. 3(3-0) F. Preliminary analysis and design of flight control systems to include autopilots and stability argumentation systems. Effects of inertial cross-coupling and nonrigid bodies on vehicle dynamics.

MAE 562 Advanced Aircraft Structures. Preq: MAE 371. 3(3-0) S. Methods of stress analysis for aircraft structures, special problems in structural design, stiffened panels, rigid frames, indeterminate structres, general relaxation theory.

MAE 571 Inertial Guidance, Design and Analysis. Preqs: MA 401, MAE 435 or MAE 462. 3(3-0) S. Design and performance analysis of inertial guidance components, subsystems and systems. Transfer functions and applications of linear system techniques to determine stability, transient response and steady-state errors of gyros, accelerometers, stable platforms and initial alignment subsystems. Error analysis and significance. Preliminary design and analysis of inertial guidance systems for flight and marine vehicles.

MAE 581, 582 Hypersonic Aerodynamics. Preqs: MA 512, MAE 521 or equivalent. 3(3-0) F,S. The latest theoretical and experimental findings in hypersonic aerodynamics.

MAE 593 Special Topics in Mechanical Engineering. Preq: Advanced undergrad. or grad. standing. 3(3-0) F,S. Faculty and student discussions of special topics.

FOR GRADUATES ONLY

MAE 601 Advanced Engineering Thermodynamics. 3(3-0) F.

MAE 602 Statistical Thermodynamics. 3(3-0) S.

MAE 603 Advanced Power Plants. 3(3-0) F.

MAE 605 Aerothermochemistry. 3(3-0) S.

MAE 606 Advanced Gas Dynamics. 3(3-0) S.

MAE 608 Advanced Heat Transfer I. 3(3-0) F.

MAE 609 Advanced Heat Transfer II. 3(3-0) S.

MAE 610 Advanced Topics in Heat Transfer. 3(3-0) S.

MAE 611, 612 Advanced Machine Design I, II. 3(3-0) F,S.

MAE 613 Mechanics of Machinery. 3(3-0) F.

MAE 614 Mechanical Transients and Machine Vibrations. 3(3-0) S.

MAE 615 Aeroelasticity I. 3(3-0) F.

MAE 617 Mechanical System Design Analysis. 3(3-0) F.

MAE 618 Mechanical System Design Synthesis. 3(3-0) S.

MAE 619 Random Vibration. 3(3-0) F or S.

MAE 622 Acoustic Radiation II. 3(3-0) F or S.

MAE 625, 626 Direct Energy Conversion. 3(3-0) F,S.

MAE 631 Applications of Ultrasonics to Engineering Research. 3(3-0) F.

MAE 651 Principles of Fluid Motion. 3(3-0) F.

MAE 652 Dynamics of Compressible Flow. 3(3-0) F.

MAE 653 Supersonic Aerodynamics. 3(3-0) S.

MAE 654 Dynamics of Viscous Fluids I. 3(3-0) F.

MAE 655 Dynamics of Viscous Fluids II. 3(3-0) S.

MAE 657 Measurement in Rarefied Gas Streams. 3(3-0) F.

MAE 658, 659 Molecular Gas Dynamics. 3(3-0) F,S.

MAE 661, 662 Aerospace Energy Systems. 3(3-0) F,S.

MAE (TX) 663 Mechanics of Twisted Structures. 3(3-0) F.

MAE (TX) 664 Mechanics of Fabric Structures. 3(3-0) S.

MAE 671, 672 Advanced Air Conditioning Design I, II. 3(3-0) F,S.

MAE 674, 675 Advanced Spacecraft Design. 3(3-0) F,S.

MAE 681 Introduction to Rocket Propulsion. 3(3-0) F.

MAE 682 Solid Propellant Rockets. 3(3-0) S.

MAE 683 Liquid Propellant Rockets. 3(3-0) S.

MAE 684 Ion Propulsion. 3(3-0) F or S.

MAE 693 Advanced Topics in Mechanical Engineering. 1-6 F or S.

MAE 695 Mechanical Engineering Seminar. 1(1-0) F or S.

MAE 699 Mechanical Engineering Research. Credits Arranged.

Meteorology

FOR UNDERGRADUATES

MY 201 Atmospheric Environment. Preqs: High school physics, chemistry, algebra, trigonometry, or equivalent. 3(3-0) F,S. Nature and processes of the atmosphere, interactions with land, sea, and life at the surface, relations to other components of the solar system; measurements and surveillance of the atmosphere and relations to climatology, weather forecasting, weather modification and air pollution, and applications to various human activities.

MY 386 Climate Near the Ground. Preqs: MA 112, PY 221. 3(3-0) S. Analysis of basic physical states and processes at the interface of atmosphere with land

surfaces and vegetation in terms of the meteorological controls. Designed to serve needs in the various plant sciences.

MY 411 Introductory Meteorology. Preqs: PY 208 or 212; MA 201 or 212. 3(3-0) F. The physical setting: coordinates, planetary motion, gravitation; composition and structure of the atmosphere; insolation and diurnal phenomena; heat balance of the atmosphere; consequent distribution of variables of state, motion and weather.

MY 412 Atmospheric Physics. Preq: MY 411 or CI. 3(3-0) S. Atmospheric effects on electromagnetic and acoustic transmission, and the consequent phenomena; terrestrial radiation; radar meteorology, visibility, atmospheric electricity and magnetism.

MY 421 Atmospheric Statics and Thermodynamics. Preqs: PY 208 or 212; MA 202. 3(3-0) F. The variables of state and thermodynamics of dry and moist air in the atmospheric system; water phase changes, hydrostatics and altimetry; stability, convection and diffusion; transfers at the surface; natural modification of air.

MY 422 Atmospheric Kinematics and Dynamics. Preqs: PY 208, MA 202; Coreq: MY 421 or CI. 3(3-0) S. Properties and fields of atmospheric motion, and variations with time; forces and force fields; equilibrium and accelerated motions; the boundary layer and momentum transfer; continuity, pressure tendency and divergence-vorticity theorems.

MY 435 Measurements and Data Systems. Preq: MY 421. 3(2-3) S. Meteorological instruments, observations and networks; data communications, reduction and presentation; meteorological charts and diagrams, fundamental analysis of physical distributions.

MY 441 Meteorological Analysis I. Preqs: MY 422, 435. 3(3-0) F. Theory and analysis of atmospheric distributions, processes and developments in the three space dimensions and time.

MY 433 Meteorological Laboratory I. Preq: MY 435; Coreq: MY 441. 4(0-10) F. Analysis of atmospheric distributions, processes and developments, employing regularly available meteorological data and the principles presented in prerequisite and corequisite courses. Student gains working knowledge of integrated atmospheric systems and processes through detailed analyses of natural situations.

MY 444 Meteorological Laboratory II. Preq: MY 443. 4(0-10) S. Analysis and application of principles and concepts for predicting developments in the weather.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

MY 512 Micrometeorology. Preq: MY 422. 3(3-0) F. Meteorology of the lowest hundred meters of the atmosphere with emphasis on the transport of momentum, heat, water vapor, and effluents and their transfer through the earth's surface.

MY 521 The Upper Atmosphere. Preq: MY 411 or CI. 3(3-0) S. Meteorological conditions in the upper atmosphere from the stratosphere to the ionosphere. Compositions, mean distributions and variabilities, and circulation and transport properties in the region. Physical theories.

MY 555 Meteorology of the Biosphere. Preqs: PY 205 or 211; CH 103 or 107; MA 102 or 112. 3(3-0) F. For graduate students in the life sciences. The physical principles governing the states and processes of the atmosphere in contact with

earth's surface of land, water, and life. Exchanges of heat, mass, and momentum are analyzed for various conditions of the atmosphere and surface, and as a function of season, time, and geographic location.

MY 556 Air Pollution Meteorology. Preq: MY 555 or equivalent. 3(3-0) S. The meteorological aspects of air pollution, especially for nonmeteorologists engaged in graduate training for work involving air pollution.

MY 593 Advanced Topics. Preq: CI. 1-6 F,S. Special topics in meteorology, provided to groups or to individuals.

FOR GRADUATES ONLY

MY 612 Atmospheric Radiative Transfer. 3(3-0) S.

MY 627 Atmospheric Turbulence and Diffusion. 3(3-0) F.

MY 635 Dynamical Analysis of the Atmosphere. 3(2-3) F.

MY 695 Seminar. 1(1-0) F,S.

MY 699 Research. Credits Arranged F,S.

Microbiology

FOR UNDERGRADUATES

MB 301 Microbial Life. 3(3-0) Sum. Basic concepts of microbiology requiring no college-level prerequisites in chemistry or biology. Although given as a terminal course, it emphasizes fundamental knowledge and concepts so that superior students may take MB 302 and organic chemistry and then take MB 501. Credit not allowed for both MB 301 and 401. Hayes

MB 302 Clinical Microbiology Lab. Coreq: MB 301. 1(0-2) Sum. Techniques of isolating and characterizing microorganisms of medical significance. Hayes

FOR ADVANCED UNDERGRADUATES

MB 401 General Microbiology. Preqs: BS 100, CH 223 or 220. 4(3-3) F,S. Rigorous introduction to basic principles and concepts of microbiology. Recommended for students in biological and agricultural sciences curricula and for all students planning to take further courses in microbiology. Credit not allowed for both MB 301 and 401. Elkan

MB (FS) 405 Food Microbiology. 3(2-3) F. (See food science, page 269.)

FOR GRADUATES AND ADVANCED UNDERGRADUATES

MB 501 Advanced Microbiology. Preq: MB 401 or MB 301 and 302. 3(3-0) F. An in-depth examination of microorganisms in relation to their natural environments, their taxonomic, nutritional, structural, and physiological interrelationships. Perry

MB (FS) 506 Advanced Food Microbiology. 3(1-6) S. (See food science, page 270.)

MB 511 Bacterial Pathogenesis. Preq: MB 401 or 301. 3(3-0) F. An in-depth consideration of the host-parasite relationship between pathogenic bacteria and

man. Attributes of bacteria which enable them to cause disease, the basic defense mechanisms of man, and chemotherapy. Hayes

MB 514 Microbial Metabolism. Preqs: MB 401 or 301, BCH 351 or 551. 3(3-0) S. The metabolic processes of microorganisms and their regulatory mechanisms. Dobrogosz

MB 521 Microbial Ecology. Preq: Sr. or grad. standing. 1(1-0) S. Concepts of microbial ecology as they relate to the role of microorganisms in the biosphere. The inter action of microbes and environmental pollutants. Perry

MB (SSC) 532 Soil Microbiology. 4(3-3) S. (See soil science, page 368.)

MB 551 Immunology and Serology. Preq: MB 401. 2(1-2) S. Concepts, principles and mechanisms of antibody production, antigen-antibody interaction, and the laboratory techniques for their demonstration and study. Lecce

MB (ZO) 555 Protozoology. 4(2-6) F. (See zoology, page 389.)

MB (GN, BCH) 561 Biochemical and Microbial Genetics. 3(3-0) F. (See biochemistry, page 206.)

MB (BAE, CE) 570 Sanitary Microbiology. 3(2-3) S. (See biological and agricultural engineering, page 208.)

MB 571 Virology. Preqs: BCH 551, MB 401. 3(3-0) S. The fundamental aspects of virus-cell interactions, including virus attachment and penetration, intracellular virus replication, metabolic changes occurring in cells as a result of virus infection and virus-induced cellular transformations. Hayes

MB (BO) 574 Phycology. 3(1-4) S. (See botany, page 212.)

MB (BO, PP) 575 The Fungi. 3(3-0) F. (See botany, page 212.)

MB (BO, PP) 576 The Fungi-Lab. 1(0-3) F. (See botany, page 213.)

MB 590 Topical Problems. Preqs: CI, grad. standing. Credits Arranged F,S. Topics presented by a visiting professor or special lecturer. Used to develop new courses or to take advantage of special competence of resident or visiting faculty members.

FOR GRADUATES ONLY

MB (SSC) 632 Ecology and Functions of Soil Microorganisms. 3(3-0) S. (Offered S 1975 and alt. years.)

MB 690 Microbiology Seminar. 1(1-0) F,S.

MB 692 Special Problems in Microbiology. Credits Arranged F,S.

MB 699 Microbiology Research. Credits Arranged F,S.

Military Education and Training

AEROSPACE STUDIES (AIR FORCE ROTC)

AS 121 The Air Force Role in the Department of Defense I. 1(1-1) F. Initial course in the four-year AFROTC curriculum. Familiarizes student with the

mission, organization and doctrine of the U.S. Air Force and U.S. Strategic Offensive Forces. Introduction to U.S. Strategic Defensive Forces. The laboratory, Corps Training, provides experience in drill movements, knowledge of customs and courtesies expected of an Air Force member, knowledge of Air Force career opportunities, and the life and work of the junior officer.

AS 122 The Air Force Role in the Department of Defense II. Preq: AS 121 or equivalent. 1(1-1) S. Continues study of U.S. Strategic Defensive Forces. Familiarizes student with Aerospace Support Forces and U.S. General Purpose Forces, including those of the Army, Navy and Marines. Corps Training stresses fundamentals needed to capably assume and discharge future responsibilities in AFROTC and the U.S. Air Force.

AS 221 The Development of Airpower I. Preq: AS 122 or equivalent. 1(1-1) F. Airpower from the early years of powered flight through World War II. Emphasis on the development of employment concepts. Factors which have prompted research and technological change. Events which show the impact of airpower on strategic thought. Corps Training develops skills and further studies the junior officer environment.

AS 222 The Development of Airpower II. Preq: AS 221 or equivalent. 1(1-1) S. Airpower from the end of World War II to the present. Emphasis on employment concepts, technological change, and the impact of airpower on strategic thought. Leadership experiences and study of junior officer environment in Corps Training.

PROFESSIONAL OFFICER EDUCATION

AS 321 National Security Forces in Contemporary American Society I. Preq: Four Year AFROTC Cadets, AS 222; Two year non-veteran students, satisfactory completion of a six week field training course (see below). 1(3-1) F. The role of national security forces in contemporary American society. The professional military as it relates to the American political and social system. Formulation of military policy is examined in terms of international and domestic constraints. A treatment of the development of modern defense strategy. The student studies and practices communicative skills. Corps Training provides for advanced leadership experience.

AS 322 National Security Forces in Contemporary American Society II. Preq: AS 321. 2(3-1) S. Continues the study of national security forces in contemporary American society. Focuses on strategy and management of modern conflict and formulation and implementation of U.S. defense policy. Brief study of the Air Force Officer classification and assignment system. Students develop their communicative skills and participate in advanced leadership situations in Corps Training.

AS 421 Philosophy of Military Leadership. Preq: AS 322. 1(3-1) F. Class and laboratory include exploration and practical experience in the need for leadership and a study of human behavior and relations that affect military leadership. Professional self-discipline, imposed discipline of military law, and an examination of the variables affecting leadership. Emphasis to developing the communicative skills, leadership abilities and basic knowledge required of a future Air Force junior officer.

AS 422 Management Applications in the Military Environment. Preq: AS 421, 2(3-1) S. Class and laboratory study of and practical experience with management functions in the military environment. The planning, organizing, directing, controlling and coordinating functions of management; the command and staff functions in advising, problem solving and decision-making situations. Emphasis on developing communicative skills, leadership abilities and basic knowledge required of an Air Force junior officer.

AS 499 Flight Instruction Program Ground School. 0(3-0) S. Develops aeronautical knowledge required by the Federal Aviation Administration for private pilots. It familiarizes students with the appropriate general and visual flight rules of Part 91 of the Federal Aviation Regulations, obtaining and evaluating of flight weather reports, and flight planning elements such as plotting courses, estimating time enroute and fuel requirements. Required in the Flight Instruction Program (FIP) for Air Force ROTC cadets.

FIELD TRAINING COURSES

AFROTC field training is offered during the summer months at selected Air Force bases throughout the United States. Students in the four-year program participate in four weeks of field training during the summer after their sophomore or junior year. Students applying for entry into the two-year program must successfully complete six weeks of field training prior to enrollment in AFROTC.

Major study areas in the four-week field training program include junior officer training, aircraft and aircrew indoctrination, career-orientation, survival training, base functions and Air Force environment, and physical training.

The six-week field training program covers all four-week field training program areas plus all of the subject matter received by four-year program cadets during their freshman and sophomore years in the General Military Course, including corps training.

MILITARY SCIENCE (ARMY ROTC)

MS 101 Military Science I. 1(1-1) F. The mission and organization of the U.S. Army, including the history of the Army ROTC program. Practical work in individual weapons and marksmanship. Leadership laboratory emphasizes essential characteristics of leadership and development of teamwork. Johnson

MS 102 Military Science I. 1(1-1) S. A seminar approach which investigates current topics of interest to the Army. Instruction in the definition, causes and evolution of warfare. Leadership laboratory continues to emphasize MS 101 goals. Johnson

MS 201 Military Science II. Preqs: MS 101, 102 or equivalent credits. 1(2-1) F. Instruction in map and aerial photograph reading; introduction to theory of small-unit basic tactics. Leadership laboratory emphasizes characteristics of leadership, development of teamwork and acceptance of responsibility. Edgar

MS 202 Military Science II. Preqs: MS 101, 102 or equivalent credits. 1(2-1) S. American Military history from Colonial days to present. Emphasis on Army development and function in times of war and peace. Leadership laboratory continues to emphasize MS 201 goals. Edgar

MS 301 Military Science III. Preqs: MS I and II or equivalent credits. 1(2-1) F. Instruction in military leadership, emphasizing troop behavior control and command problems; methods of military instruction. Leadership laboratory provides practical leadership instruction emphasizing responsibility, command and self-confidence. Baucom

MS 302 Military Science III. Preqs: MS I and II, MS 301 or equivalent credits. 2(2-1) S. The mission and function of Army branches; principles of military planning and conduct of tactical operations. Leadership laboratory continues to emphasize MS 301 goals. Baucom

MS 401 Military Science IV. Preq: MS III. 1(2-1) F. Seminar approach to military management concepts, organizational theory, operational techniques and staff procedures, fundamentals of military law. Leadership laboratory emphasizes

the practical application of classroom instruction by exercising full command and staff responsibility in planning and executing all phases of field training and leadership development. Gatti

MS 402 Military Science IV. Preqs: MS III and MS 401. 2(2-1) S. Seminar approach to leadership management in the military environment, the problems of developing nations, world position of the United States, and management of personal affairs. (UNI 402—War and Peace in the Nuclear Age may be taken in lieu of MS 402.) Leadership laboratory continues development of practical experience begun in MS 401, using field training exercises as the medium for preparation for commissioning and subsequent active military service. Gatti

Modern Languages

NOTE: All students with previous knowledge of French, German or Spanish must take the placement test upon entering the University. They will be given advanced standing and receive credit according to their score.

CLASSICS

GRK 101 Elementary Greek I. 3(3-0) F,S. Introduction to Classical Greek. Course will study Greek alphabet, three declensions, conjugation of regular and some irregular verbs. Readings based on Greek mythology, philosophy and literature.

LAT 101 Elementary Latin I. 3(3-0) F,S. Introduction to Classical Latin. Study of five declensions, present and perfect systems of four conjugations, some irregular verbs and basic syntax. Readings from Roman and Greek mythology.

LAT 102 Elementary Latin II. Preq: LAT 101. 3(3-0) F,S. Continuation and expansion of LAT 101. Various subjunctive uses, active and passive periphrastic conjugations, conditional sentences. Readings from various classical writers.

NOTE: Following courses conducted in the target language, except where otherwise stated.

MLF 301, 302; MLG 301, 302; MLR 303, 304; MLS 301, 302, 303, 304 may be used by students other than foreign language majors to satisfy the literature requirement in undergraduate degrees.

ENGLISH FOR FOREIGN STUDENTS

MLE 101 English for Foreign Students: Review Grammar. 3(3-0) F,S. Emphasis is on pronunciation, grammar and comprehension of American English.

MLE 102 English for Foreign Students: Composition. 3(3-0) F,S. Emphasis is on writing, through the study of American English syntax with extensive written exercises; additional practice in spelling.

MLE 103 English for Foreign Students: Conversation. 3(3-0) F,S. For foreign students who have studied English but need additional conversational practice. Emphasis on correct pronunciation, intonation and idiomatic expressions. Oral drills, class discussions and laboratory practice.

FRENCH

MLF 101 Elementary French I. 3(3-0) F,S. The beginning course for developing language skills. Oral and written practice in classroom and language laboratory.

MLF 102 Elementary French II. Preq: MLF 101. 3(3-0) F,S. A continuation of MLF 101, with oral and written practice in classroom and language laboratory.

MLF 201 Intermediate French I. Preq: MLF 102. 3(3-0) F,S. The third of four consecutive courses to build skills of speaking, understanding, reading and writing French. Oral and written practice in classroom and language laboratory.

MLF 202 Intermediate French II. Preq: MLF 201. 3(3-0) F,S. Last of the foundation courses in French. Greater emphasis on reading and writing. Completion will satisfy the Liberal Arts foreign language requirement.

MLF 251 Exoticism and the Fantastic in French Literature. Preq: MLF 102. 3(3-0) F,S. Readings in English translation of selected French works, with stress on critical, philosophical, and entertainment value. *Detailed explication de texte* of short passages.

MLF 257 Conventional and Avant-Garde in Contemporary French Drama. Preq: MLF 102. 3(3-0) F,S. Readings in English translation of selected French plays of the 20th century, with stress on works assimilated from Greek Tragedy; the Avant-Garde and Conventional Theater.

MLF 301 Survey of French Literature, Origins to 1800. Preq: MLF 202. 3(3-0) F,S. Readings of representative works with analytical and critical emphasis. Lectures, written and oral reports.

MLF 302 Survey of French Literature, 1800 to Present. Preq: MLF 202. 3(3-0) S. Readings of representative works with analytical and critical emphasis. Lectures, written and oral reports.

MLF 309 Advanced French Conversation and Phonetics. Preq: MLF 202. 3(3-0) F,S. Study of sound production and linguistic terminology. Daily conversational practice in classroom and language laboratory. Required of French majors.

MLF 310 Advanced French Grammar. Preq: MLF 202. 3(3-0) F,S. Thorough and in-depth study of French syntax with extensive written practice. Required of French majors.

MLF 322 French Novel Before World War II. Preq: MLF 202. 3(3-0) F,S. Readings of French novelists from 1900 to 1940. Lectures, written and oral reports.

MLF 323 Contemporary French Novel. Preq: MLF 202. 3(3-0) F,S. Readings of French novelists from 1945 to the present. Lectures, written and oral reports.

MLF 324 Contemporary French Theater. Preq: MLF 202. 3(3-0) F,S. Representative plays with stress on ideas, philosophies, and trends in France and other countries.

MLF 411 French Literature of the 17th Century. Preq: CI. 3(3-0) F,S. Analytical and critical study of writings of French Classicism. Lectures, written and oral reports.

MLF 412 French Literature of the 18th Century. Preq: CI. 3(3-0) F,S. Analytical and critical study of writings of the Age of Rationalism and Revolution. Lectures, written and oral reports.

MLF 491 Special Topics in French Studies. Preq: Consent of the department. 3(3-0) F,S. A concentrated study of a special period, author or genre, to be determined as needed in the major program.

MLF 492 Special Topics in French Studies. Preq: Consent of department. 3(3-0) F,S. A concentrated study of a special period, author or genre, to be determined as needed in the major program.

MLF 498 Special Topics in French: Independent Study. Preq: Consent of department. 1-6 F,S. A detailed investigation of a special topic in language or literature, the topic and mode of study to be determined by the faculty member and the student in consultation with the head of the Modern Language department.

FOR GRADUATE CERTIFICATION

This course does not carry undergraduate credit.

MLF 401 French for Graduate Students. 3(3-0) F. Designed to prepare students for graduate certification, this course will introduce students to basic vocabulary and structures. Frequent practice in translation. Certification is granted on satisfactory completion of the course.

GERMAN

MLG 101 Elementary German I. 3(3-0) F,S. The first in a four-course sequence intended to teach the student to understand, speak, read and write everyday German. Emphasis on speaking and understanding with additional reading of cultural materials. Intensive practice in the language lab.

MLG 102 Elementary German II. Preq: MLG 101. 3(3-0) F,S. Strong emphasis is placed on understanding and speaking, but increasing attention is given to syntax and vocabulary building.

MLG 201 Intermediate German I. Preq: MLG 102. 3(3-0) F,S. The third of four consecutive courses. Intensive conversational drill to build the students' ability to understand and speak everyday German. Supplementary readings in German literature.

MLG 202 Intermediate German II. Preq: MLG 201. 3(3-0) F,S. Last of four sequential courses. Continued use of everyday spoken German but greater emphasis on reading and writing. Completion will satisfy the Liberal Arts foreign language requirement.

MLG 254 The Novelle From Goethe to the First World War. Preq: MLG 102. 3(3-0) F,S. Study of a major form of German prose fiction from Goethe to Thomas Mann. Class conducted in English with at least one fourth of the readings in German.

MLG 255 Twentieth Century Germanic Drama. Preq: MLG 102. 3(3-0) F,S. Significant plays of Central and Northern Europe during the 20th century especially as they reflect socio-economic changes. Class conducted in English with about one third of the readings in German.

MLG 301 Survey of German Literature: Middle Ages to 1800. Preq: MLG 202. 3(3-0) F,S. Readings of representative works with analytical and critical emphasis. Lectures, class discussions, papers.

MLG 302 Survey of German Literature: 1800 to World War I. Preq: MLG 202. 3(3-0) F,S. Readings of significant authors, including the Romantic, Realist and Impressionist periods.

MLG 309 Advanced Conversation and Phoenetics. Preq: MLG 202. 3(3-0) S. Through intensive conversational practice the course will concentrate on bringing the student to a high level of ability in spoken German. Reports by students on current topics; study of special problems in pronunciation.

MLG 322 Major German Modern Writers. Preq: MLG 202. 3(3-0 F. A study of major authors of the 20th century whose reputation was established prior to World War II, including Hauptman, Schnitzler, Hofmannstahl, Hesse, Mann, Kafka, Brecht.

MLG 323 Contemporary German Literature. Preq: MLG 202. 3(3-0) S. A study of German-speaking authors whose reputation has been established since the Second World War and those whose works are now gaining attention.

MLG 498 Special Topics in German: Independent Study. Preq: Consent of the department. 1-6 F,S. A detailed investigation of a special topic in language or literature, topic, mode of study, and variable credit to be determined by the faculty member in consultation with the head of the Modern Language Department.

GRADUATE CERTIFICATION

This course does not carry undergraduate credit.

MLG 401 German for Graduate Students. Not open to undergrads. 3(3-0) F. Designed to prepare students for graduate certification, this course will introduce students to basic vocabulary and structure. Completion of the course will certify the student's reading knowledge.

ITALIAN

MLI 101 Elementary Italian I. 3(3-0) F,S. Concentrating on hearing and speaking, this course begins the development of a balanced foundation on all four language skills. Idiomatic, everyday Italian is emphasized. Class and laboratory practice, written homework.

MLI 102 Elementary Italian II. Preq: MLI 101. 3(3-0) F,S. Emphasis mainly on acquisition of oral skills through class practice and use of audio aids. Readings of simple Italian prose.

Following Courses Will be Conducted Entirely in Italian.

MLI 201 Intermediate Italian I. Preq: MLI 102. 3(3-0) F,S. The third of four consecutive courses. Its principal aim is to teach everyday, idiomatic Italian. Selected readings from contemporary Italian authors.

MLI 202 Intermediate Italian II. Preq: MLI 201. 3(3-0) F,S. Study of more advanced aspects of Italian, completing the learning of the foundation of the language. Readings from contemporary Italian authors; practice in intermediate composition. A successful pass will satisfy Liberal Arts foreign language requirement.

RUSSIAN

MLR 101 Elementary Russian I. 3(3-0) F,S. The first of four sequential courses. Students are introduced to the basic language skills: understanding, speaking,

reading and writing. Initial emphasis is on the two first, or oral, skills. Class and laboratory practice; written assignments.

MLR 102 Elementary Russian II. Preq: MLR 101. 3(3-0) F,S. Main emphasis on acquisition of basic oral skills, with complementary reading and writing exercises. Class and laboratory practice; written assignments.

MLR 201 Intermediate Russian I. Preq: MLR 102. 3(3-0) F,S. The learning of basic skills is continued. More emphasis than previously will be given to writing, but conversational practice is essential. Readings in Russian prose of intermediate level. Class and laboratory practice; written assignments.

MLR 202 Intermediate Russian II. Preq: MLR 201. 3(3-0) F,S. Study of more advanced aspects of Russian syntax through reading of prose of Russian writers. Continued attention to conversational practice and vocabulary building. Completion of this course will satisfy language requirement for Liberal Arts major.

MLR 303 Russian Literature in Translation I. 3(3-0) F,S. This course offers an introduction to Russian writers of the 19th century, such as Turgenev, Gogol, Lermontov, Pushkin, Dostoevsky, Tolstoy. Class conducted in English.

MLR 304 Russian Literature in Translation II. 3(3-0) F,S. An introduction to Russian writers of the 20th century: Gorky, Pasternak, Solzhenitsyn, Babel, Sholokov, Maiakovsky, etc. Class conducted in English.

SPANISH

MLS 101 Elementary Spanish I. 3(3-0) F,S. Concentrating on hearing and speaking, this course begins the development of a balanced foundation in all four language skills. Idiomatic, everyday Spanish is emphasized. Class practice, laboratory and written homework.

MLS 102 Elementary Spanish II. Preq: MLS 101. 3(3-0) F,S. This course expands use of Spanish through past tenses, regular and irregular, and various morphological and syntactical aspects. Emphasis on oral skills. Written work and laboratory practice assigned daily.

MLS 201 Intermediate Spanish I. Preq: MLS 102. 3(3-0) F,S. The third of four consecutive courses. As with 101 and 102, its aim is mainly to teach idiomatic, spoken Spanish. Reading and writing skills receive greater attention than previously. Class practice, laboratory and written assignment.

MLS 202 Intermediate Spanish II. Preq: MLS 201. 3(3-0) F,S. Last of four sequential courses, completing the learning of the foundations of the language. Writing will receive greater attention. Completion will satisfy the Liberal Arts foreign language requirement.

MLS 252 The Theme of Desengaño in Spanish Literature. Preq: MLS 102. 3(3-0) F,S. Comprehensive study of theme of *desengaño* in its different manifestations, mainly through the picaresque novel, baroque poetry and drama, Don Quijote, Unamuno and A. Machado. Course conducted in English with at least one fourth of readings in Spanish.

MLS 256 Alienation in the Modern Hispanic World. Preq: MLS 102. 3(3-0) F,S. A study of cultural attitudes in the Hispanic countries through readings of selected Spanish and Spanish-American essays, novels and stories. Course conducted in English with at least one fourth of readings in Spanish.

MLS 301 Survey of Spanish Literature Through Golden Age. Preq: MLS 202. 3(3-0) F. Analysis of major literary works through 1700. The study will have two main projections: aesthetic, through consideration of elements of artistic creation, criticism and genres; cultural, in relating works to spatial and temporal circumstance.

MLS 302 Survey of Spanish Literature: 1700 to Present. Preq: MLS 202. 3(3-0) S. Introduction to the study of Spanish Neoclassicism, Romanticism, Realism, and subsequent literary production. Special attention to the quest for new values in contemporary literature.

MLS 303 Latin American Literature I. Preq: MLS 202. 3(3-0) F. Survey of literary production in Spanish-American countries from pre-Hispanic to 1800. Special attention to the Baroque and the Romantic periods 1800. Lectures, class discussions, papers.

MLS 304 Latin American Literature II. Preq: MLS 202. 3(3-0) F. Introduction to the study of American literature in the Spanish language from Modernism to Garcia Marquez. Lectures, class discussions, papers.

MLS 309 Advanced Spanish Conversation and Phonetics. Preq: MLS 202. 3(3-0) F,S. Through discussions on relevant topics, class will concentrate on giving student fluent mastery of spoken Spanish. Study of main phenomena of sound production and of relevant linguistic terminology.

MLS 310 Advanced Spanish Grammar and Composition. Preq: MLS 202. 3(3-0) F,S. A thorough study of the more advanced aspects of Spanish syntax, with extensive practice in writing. Required of Spanish majors.

MLS 323 Contemporary Spanish Literature. Preq: MLS 302. 3(3-0) F. An in-depth study of Spanish prose writing from the Generation of 98 through the present. Special attention to post-Civil War authors such as Laforet, Cela, Goytisolo, etc. Lectures, discussions, term paper.

MLS 403 Cervantes. Preq: CI. 3(3-0) F. Around the central consideration of Don Quijote's definition of his role as knight errant, this course will consider the works of Cervantes and related writers. The development of the novel as a genre is examined as part of the question of human personality and of its social determinants in the Renaissance.

MLS 404 Drama of the Golden Age. Preq: CI. 3(3-0) S. After a brief introduction to medieval and early Renaissance drama, this course considers the rise and development of the Spanish stage from Lope de Vega to the late 17th century. Lectures, discussion, term paper.

MLS 491 Special Topics in Hispanic Studies. Preq: MLS 309, 310 or consent of the department. 3(3-0) F. A concentrated study of a special period, author or genre, to be determined as needed in the major program.

MLS 492 Special Topics in Hispanic Studies. Preq: MLS 309, 310 or consent of the department. 3(3-0) A concentrated study of a special period, author or genre, to be determined as needed in the major program.

MLS 498 Special Topics in Spanish: Independent Study. Preq: consent of the department. 1-6 F,S. A detailed investigation of a special topic in language or literature, the topic and mode of study to be determined by the faculty member in consultation with the head of the Modern Language department.

GRADUATE CERTIFICATION

This course does not carry undergraduate credit.

MLS 401 Spanish for Graduate Students. Not open to undergrads. 3(3-0) F. Designed to prepare students for graduate certification, this course will introduce students to basic vocabulary and structures. Frequent practice in translation. Certification is granted on satisfactory completion of the course.

Music

MUS 100 Instrumental Music. Preq: Satisfactorily passing audition. 1(0-5) F,S. The performance and study of the best in instrumental music. Assignments to various organizations made according to individual interests and abilities.

MUS 110 Choral Music. Preq: Satisfactorily passing audition. 1(0-4) F,S. The performance and study of the best in choral music. Assignments to various organizations made according to individual interests and abilities.

MUS 200 Understanding Music. 3(3-0) F,S. To assist students in developing understanding and comprehension of music heard today. Emphasis is upon evaluating musical elements and content, form, style periods, and design.

MUS 210 A Survey of Music in America. 3(3-0) Alt. years. A survey from colonial times to the present, with emphasis on the major influences which have shaped the musical literature and culture of America.

MUS 215 Music of the 17th and 18th Centuries. 3(3-0) Alt. years. Examine selected European music from 1600 to 1800, emphasis on concepts of compositional style, reflections of certain broad cultural tendencies and purely musical phenomena. Study of specific forms and genres as they evolved during this period.

MUS 220 Music of the Romantic Period. 3(3-0) Alt. years. Designed to provide insight into significant musical trends of the Romantic Period (1800-1900). Includes an analysis of prevailing musical forms, styles of composers, and relation of music to other art forms.

MUS 320 Music of the 20th Century. 3(3-0) Alt. years. Traditions and innovations in representative music of this century are examined. Emphasis upon musical ideals and materials.

MUS 495 Special Topics in Music. 3(3-0) Sum. only. Offers the musical expertise of the various musicians-in-residence; topics and subjects covered vary. Listening assignments, papers, projects, and outside reading assignments required.

Nuclear Engineering

FOR ADVANCED UNDERGRADUATES

NE 201 Applications of Nuclear Energy. Preq: PY 202. 3(3-0) S. An elementary introduction to radioactivity, fission and fusion, power production, isotopes, radiation detection, nuclear safety, environmental factors, and energy resources. Gives a broad perspective of nuclear engineering and introduces both fundamentals and applications. Murray

NE 302 Fundamentals of Nuclear Engineering. Preq: PY 410. 4(3-2) S. Topics include neutron physics, reactor theory, and reactor operations. Emphasis on basic principles underlying the design and operation of nuclear systems, facilities and applications. Lab. sessions include the various techniques of radiation detection and measurement, reactor nuclear instrumentation, and reactor measurements.
Stam

NE 401 Reactor Analysis and Design. Preq: NE 302 or 419. 4(3-2) S. Elements of nuclear reactor theory and reactor operation, including neutron slowing down and diffusion, Fermi age theory, multigroup concepts, criticality of homogeneous and heterogeneous reactors, and reactor dynamics. Observation and measurement of reactor behavior and correlation with theory. Stam

NE 402 Reactor Engineering. Coreq: NE 401. 4(3-2) F. Engineering topics pertinent to the design of reactors, including heat transfer and fluid flow in reactors, relevant computer codes, power plant thermodynamics and shielding. Laboratory experiments. Verghese

NE 403 Nuclear Engineering Design Projects. Preq: NE 402. 2(1-3) S. Student projects in design of practical nuclear engineering systems. Preliminary designs developed by teams advised by faculty, and oral and written reports presented. Current and future systems emphasized. Use of computers encouraged.
Staff

NE 419 Introduction to Nuclear Engineering. Preq: PY 202 or 208. 3(3-0) F,S. Nuclear energy applications, including nuclear reactor materials, reactor theory, shielding, thermal and hydraulic analysis, and control. Uses of nuclear fission and its by-products in research, industry and propulsion. Major engineering problems are defined and methods of approach outlined. Course designed for students in other departments. Murray

NE 491, 492 Nuclear Engineering Topics I, II. Preq: CI. Variable credit, 1-4 F,S. Detailed coverage of special topics such as: radiation applications, nuclear fuel cycles, reactor systems, radiological and reactor safety, quality assurance, reactor operation, reactor control, and nuclear measurements.
Gardner, Verghese, Bohannon, Saxe, Stam

FOR GRADUATES AND ADVANCED UNDERGRADUATES

NE 501 Reactor Analysis. Preq: NE 302 or 419. 3(3-0) F. Principles of neutron motion in matter emphasizing the analysis of the nuclear chain reactor, including neutron mechanics, flux distributions, critical mass calculations, time behavior, two group model, and reactivity calculation. Siewert

NE 502 Reactor Design. Preq: NE 501. 3(3-0) S. Elements of design and operation, including reactor materials, thermal and hydraulic analysis, control and safety, and thermal and fast reactor systems. Siewert

NE (MA) 504 Mathematical Methods in Engineering. 3(3-0) F. (See mathematics, page 304.)

NE 505 Experimental Methods in Nuclear Engineering. Preqs: NE 501, 511, Coreqs: NE 502, 512. 3(1-4) S. Laboratory experiments illustrate the principles and concepts covered in NE 501, 502, 511 and 512. Gardner

NE (PY) 511 Nuclear Physics for Engineers. 3(3-0) F. (See physics, page 338.)

NE 512 Radiation Applications. Preq: NE 511. 3(3-0) S. Applications of radiation interaction principles to practical nuclear problems. Topics include radiological safety, effects of radiation on biological and structural materials, and industrial applications of radioisotopes and radiation. Zumwalt

NE (MAT) 562 Materials Problems in Nuclear Engineering. Preq: Advanced undergrad. standing. 3(3-0) F. Reactor design and operating considerations determined by materials properties. The interrelations among materials compatibility effects, corrosion effects and radiation effects in fission and fusion reactors. Beeler

NE (MAT) 573 Computer Experiments in Materials and Nuclear Engineering. Preq: Advanced undergrad. standing. 3(3-0) F. Monte Carlo and dynamical computer experiments design and use. Beeler

NE (CE) 574 Environmental Consequences of Nuclear Power. Preq: CI. 3(3-0) S. Environmental consequences resulting from electrical power generation, with emphasis on siting, construction, and operation of nuclear power plants. Kohl, Zumwalt, Smallwood

NE 591, 592 Special Topics in Nuclear Engineering I, II. Preq: CI. 3(3-0) F,S. Topics include fast breeder reactors and nuclear fusion.

FOR GRADUATES ONLY

NE 601 Reactor Theory and Analysis. 3(3-0)

NE 602 Advanced Reactor Theory. 3(3-0)

NE 611 Radiation Detection. 3(2-2)

NE 620 Nuclear Radiation Attenuation. 3(3-0)

NE 621 Radiation Effects on Materials. 3(3-0)

NE 622 Transport of Matter in Nuclear Reactors. 3(3-0)

NE 631 Reactor Kinetics and Control. 3(3-0)

NE 641 Radioisotope Applications. 3(3-0)

NE 653 Nuclear Reactor Design. 3(3-0)

NE 691, 692 Advanced Topics in Nuclear Engineering I, II. 3(3-0) F,S.

NE 695 Seminar in Nuclear Engineering. 1(1-0) F,S.

NE 699 Research in Nuclear Engineering. Credits Arranged F,S.

Nutrition

NTR (ANS, FS) 301 Nutrition and Man. 3(3-0) F,S. (See animal science, page 200.)

NTR (ANS, PO) 415 Comparative Nutrition. 3(3-0) F. (See animal science, page 200, or poultry science, page 349.)

NTR (ANS) 416 Quantitative Nutrition. 3(1-6) F. (See animal science, page 201.)

NTR 490 Nutrition Seminar. Preq: Sr. standing. 1 F,S. Reviews, analysis and discussions of information and proposals relating to problems in human nutrition and allied areas.

NTR 590 Topical Problems in Nutrition. Preq: Grad. or sr. standing. 1-6 F,S. Discussions, readings and analysis of problems of current interest in nutrition and closely allied fields.

FOR GRADUATES ONLY

NTR 601 Amino Acids, Vitamins and Minerals in Nutrition. 4(4-0) S.

NTR 608 Energy Metabolism. 3(3-0) F.

NTR 690 Advanced Special Problems in Nutrition. 1-6 F,S.

NTR 699 Research in Nutrition. Credits Arranged F,S.

Operations Research

OR 501 Introduction to Operations Research. Preqs: MA 405, 421. 3(3-0) F,Sum. OR approach: modeling, constraints, objective and criterion. The problem of Multiple criteria. Optimization, Model validation. The team approach. Systems Design. Examples. OR methodology: mathematical programming; optimum seeking; simulation, gaming; heuristic programming. Examples. OR applications; theory of inventory; economic ordering under deterministic and stochastic demand. The production smoothing problem; linear and quadratic cost functions. Waiting line problems: single and multiple servers with Poisson input and output. The theory of games for two-person competitive situations. Project management through PERT-CPM. Graduate Staff

OR (IE, MA) 505 Mathematical Programming I. Preq: MA 405. 3(3-0) F,Sum. Mathematical methods applied to planning problems. Linear programming, a rigorous and complete development of the theoretical and computational aspects of this technique and a discussion of applications. Graduate Staff

OR (IE) 509 Dynamic Programming. Preqs: MA 405, ST 421. 3(3-0) S,Sum. The theory and computational aspects of dynamic programming and its application to sequential decision problems. Elmaghraby, Nuttle

OR 520 Theory of Activity Networks. Preqs: OR 501, OR (IE, MA) 505. 3(3-0) S. Graph theory and network theory. The theory underlying: 1) deterministic activity networks (CPM): optimal time-cost trade offs; the problem of scarce resources; 2) probabilistic activity networks (PERT): critical evaluation of the underlying assumptions; 3) generalized activity networks (GERT,GAN): applications of signal flow graphs and semi-Markov process to probabilistic branching; relation to the theory of scheduling. (Offered alt. years.) Elmaghraby

OE (IE) 522 Dynamics of Industrial Systems. 3(3-0) F. (See industrial engineering, page 293.)

OR (CHE) 527 Optimization of Engineering Processes. 3(3-0) F. (See chemical engineering, page 216.)

OR (IE) 561 Queues and Stochastic Service Systems. Preq: MA 421. 3(3-0) F. General concepts of stochastic processes. Poisson processes, Markov processes, and Renewal theory presented and used in the analysis of queues, starting with

a completely memoryless queue to one with general parameters. Applications to engineering problems. Magazine

OR (CSC) 562 Advanced Topics in Computer Simulation. 3(3-0) S. (See computer science, page 230.)

OR (CSC) 585 Graph Theory. Preq: MA 231 or 405. 3(3-0) F,Sum. Basic concepts of graph theory, Trees and forests, Vector spaces associated with a graph. Representation of graphs by binary matrices and list structures. Traversability. Connectivity. Matchings and assignment problems. Planar graphs. Colorability. Directed graphs. Applications of graph theory with emphasis on organizing problems in a form suitable for computer solution. Graduate Staff

OR (IE) 586 Network Flows. Preq: OR (IE, MA) 505 or equivalent. 3(3-0) S. Problems of flows in networks, including the determination of the shortest chain, maximal flow and minimal cost flow in networks. The relationship between network flows and linear programming. Problems with nonlinear cost functions, multi-commodity flows, and the problem of network synthesis. (Offered alt. years.) Graduate Staff

OR 591 Special Topics in Operations Research. Preq: CI. 1-3(3-0) S. Individual or small group studies of special areas of OR. Course serves as a vehicle for introducing new or specailized topics.

OR (MA, ST) 606 Mathematical Programming II. 3(3-0) S.

OR 609 Advanced Dynamic Programming. 3(3-0) F.

OR (ESM) 631, 632 Variational Methods in Optimization Techniques I, II. 3(3-0) F,S.

OR 691 Special Topics in Operations Research. 3(3-0) F,S,Sum.

OR (IE, MA) 692 Special Topics in Mathematical Programming. 3(3-0) F,S,Sum.

OR 695 Seminar in Operations Research. 1(1-0) F,S.

OR 699 Project in Operations Research. 1-3 F,S,Sum.

Philosophy

(Also see Religion.)

FOR UNDERGRADUATES

PHI 201 Logic. 3(3-0) F,S. An introduction to the methods of deductive inference. The concepts of validity and implication are defined and applied to statements and arguments. Staff

PHI 205 Problems and Types of Philosophy. 3(3-0) F,S. In this introductory course the matters discussed will always be those with a history of importance in philosophy, such as problems concerning God, freedom, justice, and the nature and objects of human knowledge. Staff

PHI 300 Early Western Philosophy. 3(3-0) F. This course traces the philosophical movements of Western Civilization from the pre-Socratics of ancient Greece to the scientific revolution of the 17th century, with particular emphasis on Plato and Aristotle. Bredenberg

PHI 301 Modern Western Philosophy. 3(3-0) S. A critical survey of selected works of the major Western philosophers from the 17th century to the present. Staff

PHI (ED) 304 Philosophy of Education. 3(3-0) F,S. This course explores the fundamental philosophical questions concerning education—namely, "What should we teach people, how should we teach it, and why?" The course is further concerned with exploring the very concepts of teaching and learning. Bryan

PHI 305 Philosophy of Religion. 3(3-0) F,S. This course combines two approaches to the philosophy of religion: phenomenological and analytic. Given this dual approach, the course deals with the questions of the existence of God and of the language about God, including such traditional problems as verification, meaning, evil, immortality, and creation. Stalnaker

PHI 306 Philosophy of Art. 3(3-0) F,S. The general objective of this course is to analyze concepts and theories encountered in discussion of art in such a way as to illuminate the nature of works of art, esthetic experiences, and art criticism. Bredenberg

PHI 307 Morality and Human Happiness. 3(3-0) F. This course raises questions about the relationship between morality and happiness—one's own and that of others. Accordingly, it explores both the nature of human happiness and the nature of justification of moral rights and obligations. Regan

PHI 308 Contemporary Moral Philosophy. 3(3-0) S. This course explores contemporary philosophical treatment of such questions as "What is the meaning of ethical terms like 'good,' 'bad,' 'right,' and 'wrong'?" and "How can moral judgments be justified or shown to be valid?" Regan

PHI 309 Contemporary Political Philosophy. 3(3-0) F,S. This course focuses on current discussions of basic concepts in political philosophy, such as liberty, equality, justice, natural rights, and democracy, with the aim of clarifying and resolving disputes concerning the relation of the individual to the state. VanDeVeer

PHI 310 Existentialism. 3(3-0) F,S. Existentialism is a major type of recent philosophy which has greatly influenced contemporary art, literature, and religion. This course traces the central existentialist motifs in the work of Kierkegaard, Nietzsche, Heidegger, Sartre, and others, and shows their influence upon contemporary culture. Fitzgerald

PHI 317 Philosophy from Descartes through Hume. 3(3-0) F. Modern philosophy is said to begin with Descartes in the 17th century. This course traces philosophic thought from Descartes through Spinoza and Liebniz on the continent of Europe to the 18th century British empiricists, Locke, Berkeley, and Hume. Metzger

PHI 318 Philosophy from Kant to the Present. Preq: PHI 317 or consent of department. 3(3-0) S. This course traces the development of philosophic thought from Immanuel Kant through the Logical Positives, G. E. Moore, Bertrand Russell, and the contemporary analytic philosophers. Metzger

PHI 330 Metaphysics. 3(3-0) S. An examination of metaphysical problems and questions, most of which have classical origins but which will usually be treated from a contemporary perspective. Typical problems are those connected with appearance and reality, free-will and determinism, mind and body, and space and time. Carter

PHI 331 Philosophy of Language. 3(3-0) F. The study of language by philosophers in the modern analytic tradition, with particular emphasis on some of the accom-

plishments and techniques of the philosophical study of language, especially meaning. Levin

PHI 333 Theory of Knowledge. 3(3-0) F. The objectives of this course include the analysis of such central concepts as knowledge, belief, and truth, and the investigation of the principles by which claims to know may be justified. Carter

PHI 335 Symbolic Logic. 3(3-0) F,S. An introduction to modern symbolic logic. Examination of the procedures for the translation of certain English sentences into logical notation and for the manipulation of that notation, so as to produce correct inferences in it. Also an introduction to the mathematical study of logic, i.e., of the properties of the symbolic system itself. Gillmor, Levin

PHI 402 Advanced Logic. Preq: PHI 335 or CI. 3(3-0) S. An informal study of the notions of truth and provability, this course emphasizes some of the theorems of mathematical logic having philosophical importance—Godel's incompleteness results and Church's theorem, for example. An introduction to recursive function theory. Gillmor

PHI 403 Foundations and Philosophy of Mathematics. Preq: PHI 335 or CI. 3(3-0) S. This course explores the alternative epistemological bases of mathematics provided by constructivism, intuitionism, formalism, and logisticism. Some of the alternative foundations compatible with the various positions—e.g., the various axiomatic set theories and category theory—are also discussed. Gillmor

PHI 405 Philosophy of Science. 3(3-0) F,S. An examination of the character and function of "explanation" in scientific activity, the concepts of law and theory, the role of inductive confirmation, and the relationship between natural and social science. Levin

PHI 490 Seminar in Philosophy. Preq: Six credits in PHI. 3(3-0) F,S. The seminars are devoted to special studies in contemporary philosophy, with emphasis on research and critical analysis. Students are expected to be familiar with the major doctrines of modern western philosophy. Staff

PHI 492 Philosophy Seminars on the Human Condition. 3(3-0) F,S. The seminars will be directed to exploring in a philosophical way the wide range of issues characterizing human experience and the human condition—such issues as capital punishment, abortion, civil rights, automation, and the quality of existence. Staff

PHI 498 Special Topics in Philosophy. Preq: Six credits in PHI. 1-6 F,S. This course is used to offer areas of study which appear only rarely in the curriculum. It will also function as a readings course for honors students in philosophy. Staff

PHI 499 Senior Essay in Philosophy. Preq: Consent of the department. 3 F,S. Individually directed research on a topic chosen in consultation with a staff adviser. The objective is a critical, written analysis of a well-defined topic in the thought of a major philosopher or in the literature of one of the main problems of philosophy. Staff

Physical and Mathematical Sciences

FOR UNDERGRADUATES

PMS 100 Orientation. 0(1-0). Preq: Required of all fr. in the School of Physical and Mathematical Sciences. Introduction to physical sciences and mathematics. Staff

Physical Education

PRESCRIBED COURSES

PE 100 Health and Physical Fitness. 1(0-2) F. A lecture laboratory course to assess and improve the individual's physical fitness, and to convey health/fitness knowledge.

PE 112 Beginning Swimming I. 1(0-2) F,S. Teaches nonswimmers the basic swimming skills necessary to demonstrate survival swimming ability.

PE 113 Beginning Swimming II. 1(0-2) F,S. Prepares weak swimmers for the intermediate swimming course.

PE 118 Restricted Activity I. 1(0-2) F,S. Meets the needs of individuals who have temporary or permanent physical impairments. Students enrolled in this program must obtain a restrictive form from the Student Health Service.

PE 119 Restrictive Activity II. 1(0-2) F,S. A follow-up of PE 118.

CONTROLLED ELECTIVE COURSES

AQUATICS

PE 221 Intermediate Swimming. 1(0-2) F,S. Gives the student competence in four basic strokes and two dives.

PE 222 Water Sports. 1(0-2) S. Water polo and water basketball, plus improvement in stamina and water skills.

PE 223 Senior Life Saving. Preq: PE 221 or equivalent. 1(0-2) F,S. Designed to qualify students for a Senior Red Cross Life Saving certificate.

PE 224 Water Safety Instructors. Preq: PE 223 or equivalent. 1(0-2) F,S. Designed to qualify students for a Red Cross Water Safety Instructor's rating.

PE 225 Scuba Diving. Preq: Demonstrate swimming proficiency. 1(0-2) F,S. Appropriate and safe use of scuba diving equipment and related in-water skills.

COMBATIVES

PE 232 Personal Defense. 1(0-2) F,S. To promote mastery of fear that may arise from the anticipation of violent personal contact and to equip students with the techniques for personal defense. To include falls, throws, counters, locks, escapes.

PE 233 Boxing. 1(0-2) F,S. Acquaints the student with the fundamentals, skills, history and rules. Emphasis on defensive techniques.

PE 238 Wrestling. 1(0-2) F,S. Fundamental skills, history and rules of wrestling and the values of regular exercise.

DEVELOPMENTAL ACTIVITIES

PE 117 Gymnastics I. 1(0-2) F,S. Fundamentals on the parallel bars, side horse, trampoline and mats.

PE 231 Body Mechanics I. 1(0-2) F,S. A program of physical development and coordinated movement.

PE 234 Gymnastics II. Preq: PE 117 or equivalent. 1(0-2) F,S. A follow-up of PE 117 emphasizing leadership training.

PE 236 Track and Field. 1(0-2) F,S. Develops knowledge, skill and interest in track and field events.

PE 237 Weight Training. 1(0-2) F,S. Basic skills of body development through weight training. The principles of strength development.

PE 239 Modern Dance. 1(0-2) F,S. Knowledge, skill and application of modern dance. It emphasizes the basic fundamentals of body movement executed to music.

INDIVIDUAL SPORTS

PE 240 Social Dance. 1(0-2) F,S. Fundamentals of leading and following including foxtrot, swing, waltz, cha-cha-cha and rumba.

PE 241 Angling. 1(0-2) F,S. Spin, fly and bait casting and an understanding of game fishing.

PE 242 Badminton. 1(0-2) F,S. Gives the beginner skill in the basic strokes and a general knowledge of the history, rules and strategy.

PE 243 Bowling. 1(0-2) F,S. Ball selection, grips, stance and delivery along with rules, history, scoring and the general theory of spare coverage.

PE 244 Fencing. 1(0-2) F,S. Fundamentals, skills, techniques and rules.

PE 245 Golf. 1(0-2) F,S. Teaches beginners the grip, stance, swing and use of the various clubs, along with the history and etiquette of play.

PE 246 Handball. 1(0-2) F,S. Fundamental skills, history and rules.

PE 247 Roller Skating. 1(0-2) F,S. The fundamental skills of skating, emphasizing balance and speed.

PE 248 Squash. 1(0-2) F,S. Fundamental skills, history and rules.

PE 249 Tennis I. 1(0-2) F,S. Gives beginners a knowledge of history, rules and strategy as well as skills.

PE 250 Tennis II. Preq: PE 249 or equivalent. 1(0-2) F,S. A follow-up of PE 249 with emphasis on game strategy and doubles play.

PE 251 Target Archery. 1(0-2) F,S. Fundamental skills and the selection and care of archery equipment.

PE 252 Downhill Skiing. 1(0-2) F,S. Fundamentals including safety, care of equipment, control, straight run, turns, and slalom. Offered in December during holidays and spring semester break dependent upon weather conditions. Minimum of 3 days on slopes required for credit.

TEAM SPORTS

PE 116 Soccer. 1(0-2) F. Fundamental skills of the game. Vigorous outdoor team sport.

PE 261 Basketball. 1(0-2) F,S. History, rules and strategy. Fundamental skills.

PE 263 Field Hockey. 1(0-2) S. History, rules and strategy. Fundamental skills.

PE 265 Softball. 1(0-2) S. Fundamental skills, history and rules.

PE 267 Touch Football. 1(0-2) F. Skills, history, rules and strategy of touch football.

PE 269 Volleyball. 1(0-2) F,S. Skills, history, rules and strategy.

VARSITY SPORTS

PE 271 Varsity Sports I. 1(0-2) F,S. For students transferring to a varsity sport for a term (eight weeks) for the first time.

PE 272 Varsity Sports II. 1(0-2) F,S. For students making their second transfer to a varsity sport.

PE 273 Varsity Sports III. 1(0-2) F,S. For students making their third transfer to a varsity sport.

PE 274 Varsity Sports IV. 1(0-2) F,S. For students making their fourth transfer to a varsity sport.

PE 280 Emergency Medical Care and First Aid. 2(2-0) F,S. Knowledge and techniques for rendering prompt and appropriate first aid and/or emergency medical care in situations when the services of qualified medical personnel are unavailable or delayed. (This course does not constitute credit toward meeting physical education requirements.)

Physical Oceanography

FOR UNDERGRADUATES

OY (MAS) 200 Introduction to the Marine Environment. Preqs: High school physics, chemistry, algebra, trigonometry, and biology, or equivalent. 3(3-0) F,S. The ocean as a part of our environment; subjects include interactions between atmosphere and ocean, ocean circulation, physical and chemical properties of sea water, marine geology, and marine biology.

OY (CE, MAS) 487 Physical Oceanography. Preqs: MA 202, PY 212. 3(3-0) S. History of physical oceanography; the geological and astronomical background for the field; tides and waves; fluid mechanics; characteristics of sea water; advective and convective processes; current measurements; laboratory models; and specific problems in physical oceanography.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

OY (MAS, CE) 541 Gravity Wave Theory I. 3(3-0) S. (See marine sciences, page 297.)

OY (MAS) 551 Ocean Circulation. 3(3-0) S. (See marine sciences, page 297.)

FOR GRADUATES ONLY

OY (MAS) 601 Advanced Physical Oceanography I. 3(3-0) F.

OY (MAS) 602 Advanced Physical Oceanography II. 3(3-0) S.

OY (MAS, ESM) 605 Advanced Geophysical Fluid Mechanics I. 3(3-0) F.

OY (MAS, ESM) 606 Advanced Geophysical Fluid Mechanics II. 3(3-0) S.

OY (MAS, ESM) 613 Perturbation Method in Fluid Mechanics I. 3(3-0) F.

OY (MAS, ESM) 614 Perturbation Method in Fluid Mechanics II. 3(3-0) S.

OY (MAS) 699 Research in Physical Oceanography. Credits Arranged F,S.

Physics

FOR UNDERGRADUATES

PY 201, 202, 203 General Physics. Preq: MA 102. 4(3-3) F,S. Intended primarily for majors in physical and mathematical sciences and nuclear engineering. Staff

PY 205, 208 General Physics. Preq: MA 102. 4(3-3) F,S. Required in most engineering curricula. A study of classical and modern physics in which the analytical approach is employed. Demonstration lectures, recitations, problem drill and laboratory work give a working knowledge of basic principles. PY 205, mechanics, sound and heat; PY 208, electricity, light and modern physics. Staff

PY 211, 212 General Physics. Preq: MA 111 or 116. 4(3-2) F,S. Designed for curricula requiring a basic though not specialized knowledge of physics. Lecture-demonstration, recitation and laboratory give a working familiarity with basic principles of mechanics, heat, sound, light, electricity and modern physics. Staff

PY 221 College Physics. Preq: MA 111 or 115. 5 (5-0) F,S. Fundamental principles applied to modern science and technology. Important concepts in the classical areas of physics, along with a brief survey of modern atomic physics. Lectures and demonstrations with class participation. Staff

PY 223 Astronomy. 3(2-2) F,S. An introductory, descriptive survey designed primarily for the non-science major, but open to all. Discussion of such recent spectacular advances in astronomy as space probes, pulsars, quasars, black holes, etc. Laboratory opportunities for direct observation of celestical objects and for experiments demonstrating the methods and techniques of astronomical research. Jenkins, Patty

PY 231 Physics for Non-Scientists. For liberal arts students only. 3(3-0) F,S. An elementary course for non-science students. The history, philosophy, methods and fundamental concepts of physics with applications to everyday modern living. Topics in mechanics, heat, electricity, light, relativity, quantum concepts, and atomic and nuclear phenomena. Moss, Seagondollar

PY 232 Physics in Contemporary Society. Preq: PY 231 or 221 or 201-202 or 205-208 or 211-212. 3(3-0) F,S. A look at how our surroundings can be influenced and understood in terms of basic physical principles. Topics include energy sources (e.g., nuclear, solar, etc.), purposes of orbiting satellites, space travel and relativity, as well as applications of physics to medical, biological and environmental problems. Emphasis on "Trans-Science", where science and society interact. Topics depend on student interest. Moss, Seagondollar

PY 240 Exophysics. Preq: MA 111 or equivalent. 3(3-0) F,S. A wide range of principles of physics is employed to examine problems in exophysics. Topics include conditions for life on other planets, possibilities of extraterrestrial intelligence, and the problems of communication with other possible extraterrestrial civilizations. Mitchell

PY 245 Physical Principles of Photography. Preqs: PY 203 or 208 or 212 or 221 or 231; CH 101 or 111. 3(2-3) F,S. The physics and chemistry of the photographic process. Students must furnish their own cameras. Cobb

FOR ADVANCED UNDERGRADUATES

PY 401, 402 Modern and Quantum Physics I, II. Preq: PY 411. 3(3-0) F,S. The basic theories of modern physics, particularly relativity and quantum mechanics. Application of these theories to atomic structure, optical spectra, x rays, nuclear physics, solid state physics and elementary particles. Patty

PY 407 Introduction to Modern Physics. Preqs: MA 202, PY 208. 3(3-0) F,S. The important developments in atomic and nuclear physics this century. Topics include: an introduction to special relativity, atomic and molecular structure, determination of properties of ions and fundamental particles, the origin of spectra, and nuclear reactions. Staff

PY 410 Introductory Nuclear Physics. Preq: PY 203 or 407. 4(3-2) F,S. The properties of the nucleus, and the interaction of radiation with matter. A quantitative description of natural and artificial radioactivity, nuclear reactions, fission, fusion and the structure of simple nuclei. Tilley

PY 411, 412 Mechanics I, II. Preqs: MA 301, PY 203 or PY 208. 3(3-0) F,S. Intermediate theoretical mechanics, including the dynamics of particles and rigid bodies, gravitation and moving reference systems. An introduction to advanced mechanics, including Lagrangian and Hamiltonian dynamics. Hall

PY 413 Thermal Physics. Preq: PY 202 or 208; Coreq: MA 301. 3(3-0) S. The statistical study of macroscopic system. Topics include basic concepts of probability, the miscoscopic states of large systems, the concepts of temperature, heat and entropy and the relations between these quantities. Manring

PY 414, 415 Electricity and Magnetism I, II. Preq: PY 203 or 208; MA 301. 3(3-0) F,S. An intermediate course in the fundamentals of static and dynamic electricity and electromagnetic theory, developed from basic experimental laws. Vector methods are employed. Johnson

PY 441 Spacetime Physics. Preq: PY 203 or 407. 3(3-0) F. An elementary introduction to the concepts and problems of spacetime physics in accord with Einstein's special theory of relativity. Historically interesting problems, e.g., the so-called clock or twin paradox, and modern problems treated by the application of the conservation laws of momentum and energy in the natural geometry of spacetime. Davis

PY 451, 452 Intermediate Experiments in Physics I, II. Coreqs: PY 411, 414. 2(1-3) F,S. Experiments in mechanics, electricity and magnetism, and modern physics. Gould

PY 499 Special Problems in Physics. Preq: Consent of department. 1-3 F,S. Study and research in classical and modern physics. Topics for experimental or theoretical investigation, or a literature survey. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

PY 506 Nuclear Physics I. Preqs: PY 203 or 407; PY 412. 4(3-2) F. Nuclear properties and phenomena such as alpha, beta and gamma decay, accelerator-induced nuclear reactions and fission. Emphasis on experimental techniques for probing nuclear structure and interpretation of results in terms of current theories. Tilley

PY 508 Ion and Electron Physics. Preq: PY 414. 3(2-2) S. Topics include collision processes, electron emission, charged particle dynamics, gaseous discharges, and the physics of ion and electron beams. Doggett

PY 509 Plasma Physics. Preq: PY 414. 3(3-0) F. The individual and collective motion of charged particles in electric and magnetic fields and through ionized gases. Doggett

PY 510 Nuclear Physics II. Preq: PY 410. 4(3-2) S. The properties of the atomic nucleus as revealed by radioactivity, nuclear reactions and scattering experiments, with emphasis on the experimental approach. The laboratory stresses independent research and offers project work in nuclear spectroscopy and in neutron physics. Waltner

PY (NE) 511 Nuclear Physics for Engineers. Preq: PY 410. 3(3-0) F. The properties of atomic nuclei, of nuclear radiations and of the interaction of nuclear radiation with matter. Emphasis on the principles of modern equipment and techniques of nuclear measurement and their application to practical problems. Waltner

PY 516 Physical Optics. Preq: PY 415. 3(2-2) F. Emphasis on the wave properties of light. Subjects include boundary conditions, optics of thin films, interference and diffraction, applications to absorption, scattering, and laser operation. A background in Maxwell's equations and vector analysis is required. Manring

PY 517 Atomic and Molecular Physics. Preqs: PY 401, 412. 3(3-0) F. The quantum mechanical treatment of structure and spectra for atoms and molecules. Topics include the hydrogen atom, helium atom, multielectron atoms, selection rules, diatomic and simple polyatomic molecules, and nuclear magnetic resonance spectroscopy. Memory

PY 520 Measurements in Nuclear Physics. Preq: PY 410. 3(2-2) S. The fundamentals of statistics (including the binomial, normal, Poisson and interval distributions) as applied to the analysis of measurements on nuclear reactions and radioactivity. Waltner

PY 521 Kinetic Theory of Gases. Preq: PY 413. 3(3-0) F. A phenomenological and theoretical study of systems of dilute gases. After treatment of the continuum mechanics of fluids, the postulates of kinetic theory are presented and the derivation from them of macroscopic conservation equations, transport laws and thermodynamic properties is discussed. Parker

PY 543 Astrophysics. Preqs: PY 203 or 407; PY 411. 3(3-0) S. The basic physics necessary to investigate, from observational data, the internal conditions and evolution of stars. Topics include the formation and structure of spectral lines, methods of energy generation and transport, stellar structure, degeneracy, white dwarfs and neutron stars. Danby

PY 552 Introduction to the Structure of Solids. Preq: PY 401. 3(3-0) S. Basic considerations of crystalline solids, metals, conductors and semiconductors. Schetzina

PY (MA) 555 Mathematical Introduction to Celestial Mechanics. 3(3-0) F. (See mathematics, page 306.)

PY (MA) 556 Orbital Mechanics. 3(3-0) S. (See mathematics, page 306.)

PY 581, 582 Quantum Mechanics I, II. Preqs: MA 512; PY 411 or 414; grad. standing or permission of graduate administrator. 3(3-0) F,S. Fundamental concepts and formulations, including interpretation and techniques, and the application of theory to simple physical systems, such as the free particle, the harmonic oscillator, the particle in a potential well and central force problems. Other topics include approximation methods, identical particles and spin, transformation theory, symmetries and invariance, and an introduction to quantum theory of scattering and angular momentum. Lado

PY 583, 584 Advanced Classical Mechanics I, II. Preqs: MA 512, PY 412, PY 414; grad. standing or permission of the graduate administrator. 3(3-0) F,S. An introduction to theoretical physics in preparation for advanced study. Emphasis is on classical mechanics, special relativity and the motion of charged particles. Topics include variational principles, Hamiltonian dynamics and the canonical transformation theory, structure of the Lorentz group and elementary dynamics of unquantized fields. Moss

PY 585, 586 Advanced Electricity and Magnetism I, II. Preqs: PY 415; grad. standing or permission of the graduate administrator. 3(3-0) F,S. Topics include: techniques for the solution of potential problems, development of Maxwell's equations; wave equations, energy, force and momentum relations of an electromagnetic field; covariant formulation of electrodynamics; radiation from accelerated charges. Doggett

PY 599 Senior Research. Preq: Sr. honors program standing, except with special permission. 3 F,S. Investigations in physics under staff guidance. May consist of literature reviews, experimental measurements or theoretical studies.
Graduate Staff

FOR GRADUATES ONLY

PY 600 Planetary Atmospheres. 3(3-0) S.

PY 601, 602 Theoretical Physics I, II. 3(3-0) F,S.

PY 609 High Energy Physics. 3(3-0) S.

PY 610 Advanced Nuclear Physics. 3(3-0) S.

PY 611, 612 Advanced Quantum Mechanics I, II. 3(3-0) F,S.

PY 622 Statistical Mechanics. 3(3-0) S.

PY 630, 631 Nuclear Structure Physics I, II. 3(3-0) F,S.

PY 641 Non-Inertial Space Mechanics. 3(3-0) S.

PY 651 Mathematics of Solid-State and Many-Body Theory. 3(3-0) F.

PY 652 Cooperative Phenomena in Solids. 3(3-0) S.

PY 690 Special Topics in Molecular Physics. 1-6 F,S.

PY 691 Special Topics in Nuclear Physics. 1-6 F,S.

PY 692 Special Topics in Plasma Physics. 1-6 F,S.

PY 693 Special Topics in Solid-State Physics. 1-6 F,S.

PY 694 Special Topics in Theoretical Physics. 1-6 F,S.

PY 695 Seminar. 1(1-0) F,S.

PY 699 Research. Credits Arranged F,S.

Physiology

PHY (ANS) 502 Reproductive Physiology of Vertebrates. 3(3-0) S. (See animal science, page 201.)

PHY 503 General Physiology I. Preq: Sr. or grad. standing. 3(3-0) F. The general principles of homeostatis emphasizing the importance of integrative action. Study of following systems: respiratory, cardiovascular, renal, reproductive, and myological. Longmuir, Staff

PHY 504 General Physiology II. Preq: Sr. or grad. standing. 3(3-0) S. The general principles of homeostatis emphasizing integrative action. Study of: alimentary, reticuloendothelial, central nervous, autonomic nervous, and endocrine systems; detoxication mechanisms; special senses, and the response of man to the environment. Longmuir, Staff

PHY (ZO) 513 Comparative Physiology. 4(3-3) S. (See zoology, page 388.)

PHY (BCH) 553 Physiological Biochemistry. 3(3-0) S. (See biochemistry, page 205.)

PHY (ZO, ENT) 575 Physiology of Invertebrates. 3(3-0) F. (See zoology, page 389.)

PHY (ANS) 580 Mammalian Endocrine Physiology. 3(3-0) F. (See animal science, page 201.)

PHY 590 Special Problems in Physiology. Preq: CI, grad. standing. Credits Arranged. Graduate Staff

FOR GRADUATES ONLY

PHY (ANS) 604 Experimental Animal Physiology. 4(2-4) F.

PHY 690 Physiology Seminar. 1(1-0) S.

PHY 695 Selected Topics in Physiology. 1-4.

PHY 699 Physiological Research. Credits Arranged F,S.

Plant Pathology

FOR UNDERGRADUATES

PP 315 Plant Diseases. Preq: BS 100. 3(2-3) F,S. The nature and symptoms of plant disease and characteristics of plant pathogenic nematodes, viruses, bacteria

and fungi. Concepts and methods of disease control developed, based on knowledge of major types of diseases. Strider, Beute

PP (FOR) 318 Forest Pathology. Preq: BS 100 or equivalent. 4(3-2) S. Major types of diseases of forest trees and deterioration of wood products are studied emphasizing: 1) principles of plant pathology; 2) symptomatology and diagnosis; 3) nature of disease-causing agents; 4) physiology, ecology and dissemination of disease-causing agents; 5) mechanisms of pathogenesis; 6) epidemiology and environmental influences; 7) principles of control. Grand

FOR GRADUATES AND ADVANCED UNDERGRADUATES

PP 500 Plant Disease Control. Preq: PP 315. 3(2-3) S. Disease control strategies and tactics. Consideration of control economics and practices in relation to principles and current research, disease resistance and regulatory methods.
Jenkins, Spurr

PP 501 Phytopathology I. Preq: PP 315 or equivalent. 5(3-6) F. Classification, terminology, etiology and basic concepts of plant diseases caused by fungal, bacterial and abiotic agents. In-depth studies of carefully selected examples illustrate and integrate general principles. Laboratory devoted to research and diagnostic techniques including media preparation, isolation and study of pathogens in pure culture, inoculation, symptom development and disease measurement.
L. Lucas, Echandi

PP 502 Phytopathology II. Preq: PP 315 or equivalent. 5(3-6) S. Viruses and nematodes as plant pathogens. Major topics such as physiology of the diseased plant, variation of plant pathogens, epidemiology, and control of plant disease. Lab.—useful research and diagnostic techniques used in the study of viruses, nematodes, epidemiology and control. Powell, Main, Gooding, Barker

PP 503 Identification of Plant Pathogenic Fungi. Preq: Mycology or one advanced PP course. 3(4-12) Sum. Recognition and identification of fungi which cause plant diseases and differentiation of fungal diseases from those caused by other agents. Use of keys in identifying fungi and major sources of descriptive information on plant pathogens. (Offered Sum. 1976 and alt. years.) Grand

PP (BO, MB) 575 The Fungi. 3(3-0) F. (See botany, page 212.)

PP (BO, MB) 576 The Fungi Lab. 1(0-3) F. (See botany, page 213.)

PP 595 Special Problems in Plant Pathology. Preq: CI. Credits Arranged, Maximum 6. Investigation of special PP problems (original research or literature survey) not related to a thesis problem. Staff

FOR GRADUATES ONLY

PP 604 Morphology and Taxonomy of Nematodes. 3(1-6) S.

PP 605 Plant Virology. 3(1-6) F.**

PP 608 History of Phytopathology. 1(1-0) F.**

PP 609 Current Phytopathological Research under Field Conditions. 2(1-3) S.

PP 611 Advanced Plant Nematology. 3(2-3) S.*

PP 612 Plant Pathogenesis. 3(2-3) F*.

* Offered even years.
** Offered odd years.

PP 614 Nematode Development, Cytology and Genetics. 2(1-3) F.*

PP (BO) 625 Advanced Mycology. 4(2-6) F.*

PP 650 Colloquium in Plant Pathology. 3(3-0) F.**

PP 690 Seminar in Plant Pathology. 1(1-0) F,S.

PP 699 Research in Plant Pathology. Credits Arranged.

Advanced courses in Mycology are also available at UNC-Chapel Hill.

Politics

FOR UNDERGRADUATES

PS 201 The American Governmental System. 3(3-0) F,S. A study of the American federal system, integrating national and state government, with emphasis on constitutional principles, major governmental organs, governmental functions, and the politics and machinery of elections. Some attention to other types of political systems, and comparisons made where relevant. Staff

PS 202 Introduction to Politics. 3(3-0) F,S. A survey of existing knowledge about politics and political systems, including the theories and characteristics of political behavior and political institutions within and among nation-states. Block, Hurwitz, Kebschull, Petersen

PS 206 Local Governmental Systems. 3(3-0) F,S. In addition to examination of traditional local forms—city, county, township, and district—attention to the national, state, and regional contexts for local government. Topics include federalism and intergovernmental relations, governmental structures, political processes and political power, urbanization and problems of social and technological change, and approaches to reform. McClain, Wentworth, Rassel

PS 222 Introduction to Global Politics. 3(3-0) F,S. Man's political activities viewed from a dynamic and future oriented, global (planetary) perspective. The structure of the global political system in terms of the principal actors, including nation-states, international organizations, multi-national corporations, and subnational actors. Attention to problems having planetary dimensions, such as wars and arms races; poverty, inequality, and injustice; and the ecological concerns of population growth, resources depletion, and pollution. Soroos

PS 301 Modern Political Systems: Europe. 3(3-0) F. A comparative analysis of the structure and processes of politics in the United Kingdom, France, and Germany. Kebschull

PS 302 Modern Political Systems: Asia. 3(3-0) S. A comparative analysis of the structure and processes of politics in Japan and Communist and Nationalist China. Petersen

PS 303 Southeast Asia: Politics and Political Change. 3(3-0) S. The political systems and the processes of political change in 10 states of Southeast Asia from Burma on the west to the Philippines on the east. Some attention to individual case studies of political systems, but primarily presented in a comparative

* Offered even years.
** Offered odd years.

manner dealing with particular challenges and responses common to several systems. Tilman

PS 307 Criminal Justice Policy Process. 3(3-0) F,S. The processes of formulating and implementing policies in various criminal justice institutions. Police agencies, solicitors offices, courts, prisons, and probation and parole departments are analyzed as public bureaucracies. Emphasis on how key executives—police chiefs, judges, and prison wardens—interact with subordinates and with the larger political environment outside their organization. Students consider policy alternatives and obstacles administrators encounter in trying to get compliance with policy directives. Wentworth

PS 312 The Legal Sub-system: Law and Courts in the American Political System. 3(3-0) F,S. The role of courts, state and federal, in the political system, including: 1) structure, court organization and legal personnel, 2) law and the need for social order, including the role of protest and civil disobedience, and 3) functions performed by courts in the political system, from dispute settling to the initiation of social change. Rubin

PS 321 U.S. Foreign Policy. 3(3-0) F. The determinants of American foreign policy and the economic, military, strategic, and psychological factors conditioning that policy. Emphasis on policy formulation, including the roles of the Executive, Congress, and public opinion, and on problems of content and execution. Gilbert

PS 322 International Relations. 3(3-0) F. The patterns of international life, the controls upon international behavior, including the development of the United Nations and the major problems in international relations since World War II. Attention to the national interests and foreign policies of the states belonging to the Western and Soviet blocs, with emphasis on the positions of the United States and the Soviet Union, and to the development and impact of newly emerging nations. Petersen

PS 376 Latin American Government and Politics. 3(3-0) S. An analysis of governmental structures, political parties and ideologies, with emphasis on the period since 1910. Social revolution, nationalism, and relations with the United States will be stressed within the Latin American political context. Gilbert

PS 391 Methodology of Political Science. Preq: PS 201 or 202 or CI. 3(3-0) F,S. An analysis of the principles and procedures of political science research including: 1) the philosophy of science; 2) theory construction; 3) sampling, measurement of political variables and research designs; and 4) other methods of political research, such as content analysis, use of aggregate data and simulation research. Clary

PS 401 American Parties and Pressure Groups. 3(3-0) F. Political parties and interest groups as instruments for shaping public policy and implementing democratic values. They are considered as variables in the larger American system within which they exist. Attention on the nature of organization, membership and leadership recruitment process, and problems in aggregating votes. Topics such as political style—the relationship between major and minor parties and the differences between the major parties. Holtzman

PS 403 Black Americans in American Politics. Preq: Six hours of social sciences. 3(3-0) F,S. The political activity of the Afro-American; the sources of and the kinds of attitudes he brings into the American political system; the contrast in political activity engaged in by different black groups and reasons for the differences; the impact of the blacks' efforts on policy-making institutions such as city councils, legislatures and executive branches of government at the state and national level. Staff

PS 404 Black Political Ideology. Preq: Six hours of social sciences. 3(3-0) F,S. The political thought of black and non-black political thinkers on the problems, struggle and movement of the Afro-Americans. Black political ideology is related to the Afro-American movement for social change and is placed into the mainstream of traditional and modern political philosophy. Staff

PS 405 National Security Policy. Preq: PS 321. 3(3-0) F,S. An investigation into 1) the making of security policy, including the role of the Executive, Congress, and non-governmental actors; 2) the evolution of changing assumptions, strategies, and goals; and 3) the nature of U.S. security requirements, U.S. military commitments abroad, and the "costs" of strategies based on arms superiority, arms control and disarmament. Gilbert

PS 406 Politics and Policies of American State Governments. 3(3-0) F,S. A comparative study of the politics and policies of the 50 states. Cultural, socio-economics and political variations and state response to intergovernmental domestic programs. The analysis of state efforts in taxation, education, health, welfare, transportation and regulatory policies, the implementation and administration of national programs in the state and the state's role in urban affairs. Williams

PS 421 Soviet and Soviet Bloc Foreign Policy. Preq: Jr. standing. 3(3-0) F,S. The elements of continuity and change in Soviet foreign policy from 1917 to the present and the post World War II policies of the Eastern European states. Foreign policy decisions are examined in light of the national interests of the Soviet Union and the Eastern European states. Attention to the emergence of polycentrism, the Sino-Soviet split, and Soviet bloc relations with the West. Mastro

PS 431 International Organization. 3(3-0) S. The evolving machinery and techniques of international organization emphasizing the establishment, operation and development of the United Nations. Petersen

PS 461 Public Opinion in Democracies. Preq: Three hours PS. 3(3-0) F,S. The nature of public opinion and its functions in a democratic system of government. Focus is primarily on public opinion in the United States but also comparisons with other nations. Areas emphasized are: theories concerning opinion formation and functions, public opinion research methodology, public opinion and policy development, and empirical studies on public opinion. Clary

PS 472 Soviet Politics. 3(3-0) F,S. The contemporary Soviet political system, its structure, functions and processes, with brief consideration of the historical and ideological base of Soviet politics. Analysis designed to elucidate the similarities and differences of the Soviet system with other political systems. The Soviet system will be tested against a theoretical model of totalitarian dictatorships. Mastro

PS 473 Political Systems of New States. 3(3-0) F. General characteristics of the political systems of the new states in Asia and Africa. Survey of the pattern and nature of colonialism, the independence movements, and the contemporary social and economic conditions of the new states. Focus on political ideologies, elites, and organizations and processes. Attention to the role of intellectuals and the military. An examination of major political, social, and economic problems. Kebschull

PS 475 Governments and Politics in the Middle East. 3(3-0) S. An overview of the historical, socio-cultural, economic and ideological characteristics of the Middle East, and of various countries within the region, for the purpose of considering in detail the processes and problems of political modernization and the nature of conflicts, particularly the Arab-Israeli conflict. Hurwitz

PS 492 Seminar in Politics. Preq: PS 391 or CI. 3(3-0) F,S.

PS 493 Seminar on Theories of Political Violence and Nonviolence. Preq: Jr. standing. 3(3-0) S,Sum. The use of violence and nonviolence as methods for resolving conflict in a variety of national and international political arenas. Principal questions: What types of individuals, groups, or governments are likely to employ violent or nonviolent political behaviors? What motivations do political actors have for using these strategies? In what types of political, economic, and social situations is violence likely to occur? What are the outcomes of violent and nonviolent strategies of political conflict resolution? Soroos

PS (SOC) 494, 495 Urban Seminar. Preq: Jr. standing. 3(3-0) F,S. A study of urban and urban-related problems through theories from politics, sociology, and economics, and their application to an existing environment. Formal study and research in various local communities. Students will be involved with public and private agencies and with local leaders in ongoing programs in Raleigh and adjacent communities. Staff

PS 496 Governmental Internship and Seminar. Preq: Jr. standing and approval of committee of selection. 3-6 S,Sum. Formal seminars; lecture-discussions by political scientists, legislators, executives, judges, representatives of special interests and news media; four to six hours a day working on assignment to and under supervision of legislators or executives; formal report at completion of an internship. Staff

PS 498 Special Topics in Politics. Preq: Six hours PS. 3-6 F,S. Detailed investigation of a topic. Topic and mode of study determined by the student and a faculty member. Staff

PS 500 Political Thought: Plato to the Reformation. Preq: CI 3(3-0). F. The emergence and development of theories underlying or explaining the political aspects of behavior, approached through the study of the writings of the principal political philosophers from the days of the Greek city-state to the Reformation. Marshall

PS 501 Modern Political Theory. Preq: CI. 3(3-0) S. The state and its relationship to individuals and groups, approached through reading from the works of outstanding philosophers from the 16th century to the present. Marshall

PS (ED) 502 Public Administration. Preq: PS 202 or CI. 3(3-0) F,S. The factors which contribute to goal displacement in public agencies and the institutions, concepts and techniques which may be used in such agencies to reduce the effects of these factors. Block, McClain, Ellis

PS 503 Comparative Administration. Preqs: PS 502, 473 or CI. 3(3-0) F,S. Concentration on administrative systems of developing nations with limited attention to developed systems. Emphasis on administrative aspects of governmental change and modernization in developing nations; colonial influence on administration; problems of establishing new nations and adapting to change in established states; bureaucratic development and behavior; theories of development administration. Ellis

PS 505 Contemporary Political Theory. Preq: CI. 3(3-0) S. Major topics include the relationship between political science theory and political philosophy; the foundations, conditions, and prospects of democratic forms of government; bureaucratization and democratic values; theories of mass society; violence and revolution as possible instruments of democratic change; human nature and politics; and dilemmas of modern citizenship. The actual and potential contributions of empirical studies to the analysis of the various topics. Writers studied range from social

scientists, Robert Dahl and Seymour Lipset, to political philosophers Leo Strauss, Herbert Marcuse, and Albert Camus. Marshall

PS 506 Public Personnel Administration. Preq: PS 502 or CI. 3(3-0) Sum. The institutions and the sequence of processes in public personnel administration. Examines existing practices but primarily concerned with emerging theories and trends. Ellis

PS 507 Collective Negotiations in the Public Service. Preq: PS 201 or CI. 3(3-0) Sum. Intensive consideration of the background of the collective negotiations movement; analysis of key policy issues, such as bargaining rights and use of strike weapons; framework for collective negotiations; scope and conduct of negotiations; impasse resolution; grievance procedure. Ellis

PS 509 Scope and Method of Politics. Preq: PS 201 or CI. 3(3-0) F,S,Sum. Reviews contemporary theories, concepts, and methods fundamental to the study of politics. Emphasis on current empirical research and the collateral involvement in research activities aimed at developing basic skills in this area. Williams

PS 510 Public Finance. Preq: EC 205. 3(3-0) F. The theories and practices of governmental taxing, spending, and borrowing, including intergovernmental relationships and administrative practices and problems. McClain

PS 511 The Budgetary Process. Preq: CI and at least nine hours in social sciences, including an American government course. 3(3-0) S,Sum. The generalized budgetary process used at all levels of government in the United States. Understanding is based upon comprehension of the institutions involved, the roles of politicians and professionals, and the objectives of budgetary systems. Budgetary reforms and the expanding planning-programming-budgeting system as a management tool. McClain

PS 512 American Constitutional Theory. Preq: PS 202 or CI. 3(3-0) F. Basic constitutional doctrines, including fundamental law, judicial review, individual rights and political privileges, and national and state power. Attention to the application of these doctrines to the regulation of business, agriculture and labor and to the rights safeguarded by the First, Fifth, and Fourteenth Amendments. Cahill, Rubin

PS 513 Constitutional Theory II. Preq: Advanced undergrad. or grad. standing. 3(3-0) F,S. A continuation of PS 512 but may be elected separately. An examination of leading constitutional cases, especially in the fields of civil liberties and individual rights, and the writings of leading commentators. Cahill

PS 515 American Political Thought. Preq: Sr. or grad. standing. 3(3-0) F,S. Examines and evaluates major American writings on the nature and purpose of politics. Readings in: 1) Various interpretations of the American Constitution and the principles embodied therein; 2) Writings on civil and natural rights; 3) The character of American liberalism; 4) Black American political thought and 5) The contemporary crisis in liberal thought. Develops the independent capacity to read and reflect with care on the grounds of different views about American politics. Marshall

PS 516 Public Policy Analysis. Preq: Grad. standing; advanced undergrad. standing and CI. 3(3-0) F,S. The theories and methodology of analyzing and explaining public policy and the substance of recent domestic policies in the human and physical resources area, including welfare, poverty, education, housing, urban renewal, transportation, recreation-conservation, and agriculture. Williams

PS (SOC) 517 The Police Bureaucracy in a Democratic Society. Preq: Sr. or grad. standing. 3(3-0) F,S. Seminar focuses on the proposition that police departments are bureaucratic organizations which can be studied as such. Emphasis on understanding the process by which police policy is made. Internal and external, psychological and structural variables are identified in tracing decisions on specific issues. Thus, attitudes of policemen, the nature of their work, and the resources and power of various constituencies are factors seen as determining police behavior.
Wentworth

PS 520 Urban Politics. Preq: PS 206. 3(3-0) F,S. A comparative study of political conditions in cities and localities. Topics include the formal structures and rules of city and metropolitan governments, and the relationships to the informal norms and distribution of power; patterns of local decision-making; elite recruitment and citizen participation; variations of local autonomy and the scope of local politics; and approaches to urban policy issues. Clary

PS 521 Problems in Urban and Metropolitan Area Government. Preq: PS 206 or CI. 3(3-0) F. Examines theory and research on problems affecting governments in metropolitan areas. Attention to problems which affect (or result from) governmental structure, institutions, and politics and to the alternative approaches to their solution. Graduate Staff

PS 522 Seminar on War and Peace. Preq: Sr. standing. 3(3-0) S,Sum. The theory and research of the international peace research community examined following an overview of trends in international relations. Primary attention to the nature and causes of wars and arms races as well as to strategies for their prevention. Reflection on the nature of peace raises problems related to alleviation of poverty and injustice and to the planetary ecological concerns of population, resources, and pollution. Soroos

PS 531 The Legislative Process. Preq: PS 206 or CI. 3(3-0) S. A study of the formulation of public policy from the institutional and behavioral viewpoints. Important current legislative problems at the congressional and state legislative levels serve as a basis for analyzing the legislative process. Holtzman

PS 532 The Chief Executive. Preq: PS 202 or CI. 3(3-0) F,Sum. Three major concepts, as developed under several incumbents: 1) The institutions which surround the chief executive office and which facilitate the expansion of its power and operations. 2) The various roles, which are played by different chief executives. 3) The processes of leadership by which the chief executive can attempt to direct the machinery of government to achieve predetermined objectives. Holtzman

PS 542 Governmental Planning. Preq: PS 502. 3(3-0) F,Sum. The planning function at all levels of government in the United States, with particular attention to the problems posed for planning by the rapid growth of metropolitan areas.
McClain

PS 552 Seminar in Management Systems. Preq: Six hours of graduate public administration including either PS 509 or 516. 3(3-0) S. A seminar that is an integral part of the Master of Public Affairs program in politics. Study in detail of the various management systems in use in the public administration field. Through case studies and applied methodology, students apply management systems theory to practical problems in the public sector. Staff

PS 572 Seminar in Comparative Politics. Preq: One course in comparative politics. 3(3-0) F,S. After a survey of the problems and methods of comparative political analysis, students will be assigned a specific, limited subject to be examined within

the framework of a systematic, analytical scheme. Topics drawn from political ideologies, political groups, political elites, and decision-making institutions and processes. Kebschull

PS 573 Problems of National Integration and Institution Building in Black Africa. Preq: One course in comparative government or CI. 3(3-0) S. A central problem in the political development of African nations is the building of institutions capable of creating and managing change in the face of cultural pluralism. Theories of cultural pluralism, the background and consequences in Africa, and the attempts by various political actors and institutions (e.g., "charismatic" leaders, political parties, armies, governments) to cope with it. Hurwitz

PS 574 Political Systems and Constraints on Development in Latin America. Preq: Sr. or grad. standing. 3(3-0) S. The adequacy of Latin America's contemporary political systems for meeting the challenges of economic development. Several different approaches to developmental problems, as well as political factors which have retarded their implementation. The political systems of Latin America, the value systems and power capabilities of important groups and the leftist critique of the established political systems and its relationship to contemporary guerrilla movements. Staff

PS 575 Political Development. Preq: Nine hours PS. 3(3-0) F. The concept, theories, characteristics and problems of political development. Within a broad historical framework, subjects are analyzed in relationship to political development. Subjects include: political culture, integration, institutions, military forces, and economic development. Data derived from comparative cultural and political studies are employed in an attempt to discover patterns of change. Kebschull, Hurwitz

PS 578 Comparative Communist Systems. Preq: A comparative government course or CI. 3(3-0) S. The international Communist movement and the evolution of the international sub-system of states. Focuses on the Soviet and Chinese systems as alternative models for development in Communist and non-Communist states. Emphasis on the institutional, political and ideological similarities and differences within the Communist world and major parties outside the state system. Mastro

PS 590 Topics in Political Theory. Preq: Sr. or grad. standing. 3-6 F,S,Sum. Examination of particular topics or theorists not included in basic political theory. Course content changes and, with permission of instructor, the course may be repeated for credit. Topic examples are: foundations of modern radicalism, 20th century political philosophy and political science, political philosophy and the problem of law, and origins of political science. Marshall

FOR GRADUATES ONLY

PS 601 Seminar in Party and Group Politics. 3(3-0) F.

PS 602 Seminar in Legislative Problems. 3(3-0) S.

PS 603 Seminar in Administrative Problems. 2-4 S.

PS 604 Seminar in Judicial Problems. 3(3-0) S.

PS 605 Seminar in Organization Theory. 3(3-0) F.

PS 606 Seminar in Policy and Administration. 3(3-0) F,S.

PS 621 Seminar in International Politics. 3(3-0) S.

PS 696 Seminar in Politics. 2-4 F,S,Sum.

PS 699 Research in Politics. Credits Arranged, F,S.

Poultry Science

FOR UNDERGRADUATES

PO 201 Poultry Science and Production. Preq: BS 100. 4(3-3) F,S. Fundamental principles of broiler, turkey and egg production including poultry physiology, breeding, incubation, housing, nutrition, disease control, management and marketing. Parkhurst

PO 301 Evaluation of Live Poultry. Preq: PO 201. 2(1-3) S. Experience in evaluating live poultry for production and breeder stock potential. Emphasis on techniques and criteria used in selecting poultry for use in commercial production units. Parkhurst

PO 351 Grading and Evaluation of Poultry Products. Preq: PO 301. 2(1-3) F. Experience in grading and evaluating poultry products, such as dressed broilers, fowl, turkeys, shell eggs and broken out eggs. Parkhurst

PO (VET) 401 Poultry Diseases. 4(3-3) S. (See veterinary science, page 383.)

PO 402 Commercial Poultry Enterprises. 4(3-3) S. Principles of production and incubation of hatching eggs; hatchery operation; organization and development of plants for the operation and maintenance of commercial facilities for poultry meat and egg production; building construction, insulation and equipment and management methods. Staff

PO (FS) 404 Poultry Products. 3(2-3) F. (See food science, page 269.)

PO 405 Avian Physiology. Preq: CH 220. 4(3-3) S. The principles of avian physiology integrating the physiological processes and the associated anatomical structures that insure the homeostatic state in birds. Thaxton

PO (ANS, NTR) 415 Comparative Nutrition. Preq: CH 220 or 221. 3(3-0) F. Fundamentals of animal nutrition, including the classification of nutrients, their requirement and general metabolism by different species for health, maintenance, growth and other productive functions. Donaldson or Ramsey

PO 490 Poultry Seminar. Preq: Required of PO srs. 1(1-0) F. Current topics and problems are assigned for oral report and discussion. Cook

PO 495 Special Problems in Poultry Science. Preq: Jr. standing and CI. 1-6 F,S. Individualized study of problems in student's interest area and not covered in scheduled courses. Emphasis on research problems developed with faculty approval. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

PO (GN) 520 Poultry Breeding. Preq: GN 411. 3(2-2) F. Application of genetic principles to poultry breeding considering physical traits and physiological characteristics—feather patterns, egg production, hatchability, growth, body conformation and utility. Briggs

PO (ZO) 524 Comparative Endocrinology. Preq: ZO 421 or equivalent. 4(3-3) S. The endocrine system's physiological importance to metabolism, growth and reproduction. Prince

FOR GRADUATES ONLY

NOTE: Graduate courses may not be offered if registration for the course is too low or if faculty or facilities become unavailable.

PO 698 Special Problems in Poultry Science. Maximum 6 F,S.

PO 699 Poultry Research. Credits Arranged F,S.

Product Design

PD 321, 322 Colloquium I, II. 1(1-0) F,S. Survey of historically evolving passive and active interaction of the arts, technological, sociological, and psychological forces. Lectures and discussions led by professional authorities (faculty and guests). Required reading, field experience. Staff

PD 400 Intermediate Product Design (Series). Preq: DN 202 or equivalent or consent of department. 4(6-3) F,S. This group of courses is concerned with social/economic age groups, forms and rates of production, and natural and synthetic materials. Staff

PD 411, 412 Applied Physical Principles. Preq: Intermediate design standing. 3(2-2) F,S. Experiments applying physical principles to product design and development. Staff

PD 421, 422 Colloquium III, IV. 1(1-0) F,S. Continuation of Colloquium I, II (PD 321, 322). In-depth consideration of communication, communication systems, and media. Faculty, guest lecturers, discussions, and field experience. Required selected reading. Staff

PD 431, 432 Office and Industrial Practice I, II. 1(1-0) F,S. Ethics, organization, and procedures of professional product design practice; patent law. Staff

PD 440 Intermediate Visual Design (Series). Preq: DN 202 or equivalent or consent of department. 4(6-3) F,S. Investigations of visual environment through the agency of various materials and processes leading to professional competence. Staff

PD 490 Intermediate Special Profects (Series). 2-4 F,S. Projects guided by faculty specialists in areas supplementary to product design and visual design option. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

PD 501, 502 Product Design V, VI. Preq: PD 400 or grad. standing. 6(3-12) F,S. PD 501—Unlimited production systems designed with object(s) possibilities produced additively of new synthetic materials utilizing new molecular joining for national class and age groups. PD 502—Unlimited production systems designed object(s) possibilities produced additively of new synthetic materials utilizing new molecular joining for international class and age groups. (Individually selected problems with interdisciplinary team organizations.) NOTE: It is assumed the program is cumulative and that statements are problem parameters, exclusive of communication requirements. Graduate Staff

PD 511, 512 Materials and Processes V, VI. Preq: Grad. standing. 2(1-3) F,S. Advanced studies in mass production processes and their influence on design. Material search and process selection in relation to cost, function, human factors, form, finishes, and joining methods, as indicated by current design projects in which students are involved. Graduate Staff

PD 532 Office and Industrial Practice. Preq: PD 432 or grad. standing. 1(1-0) F,S. Advanced studies and procedures of professional product design practice, product and industrial planning, and patent law. Graduate Staff

PD 541, 542 Advanced Visual Design I, II. Preqs: ARC 400, LAR 400, PD 400, PD 440; waiver of prerequisites is at the discretion of the instructor. 6(3-9) F,S. Applying design and visual communications studies to variety of visual problems presented by physical environment. Graduate Staff

PD 590, 591 Special Projects. 2-4 F,S. Interdisciplinary projects guided by faculty specialists from areas supplementary to product design. Emphasis on latest technological development of new materials. Concept of new useful design for the mass market. Production aspects of products such as materials, processes, functions, human factors, form, sales appeal, finishing and assembly methods and packaging stressed in special projects designs. Graduate Staff

FOR GRADUATES ONLY

PD 601, 602 Advanced Product Design VII, VIII. 6(0-18) F,S.

PD 631, 632 Advanced Concepts in Product Engineering. 3(3-0) F,S.

Psychology

FOR UNDERGRADUATES

PSY 200 Introduction to Psychology. 3(3-0) F,S. General characteristics of human behavior, including motivation, learning, development, thinking, perception, sensation and measurement. The objectives are: development of the ability to communicate in oral and written form accurately and scientifically about behavior; development of an understanding of and a capacity to use scientific ideas and processes as they apply to behavior; an understanding of the behavior of organisms. Staff

PSY 210 Psychological Analysis Applied to Current Problems. Preq: PSY 200. 3(3-0) F,S. Seeks to develop skill in the analysis and understanding of certain current problems through the use of psychological knowledge and techniques. Problems studied will be selected each time from such topics as: the effects of automation, the racial crisis, international conflict, human development, population control, etc. Criteria for topics is existence of a substantial scientific psychological literature in the area. Miller

PSY 300 Perception. Preq: PSY 200, introductory BS, CH or PY recommended. 3(3-0) F,S. An introduction to anatomy and physiology of major sensory systems, their relation to central structures, and basic problems dealt with by psychophysics. Examination of the chief determiners of perception, including both stimulus variables and such organismic variables as learning, motivation, and attention. The discussion of perceptual theory and processes emphasizes topics in two- and three-dimensional spatial perception. Staff

PSY 304 Educational Psychology. 3(3-0) F,S. Introduction to a model of instruction through readings, group activities, and class discussions. Engages student in activities which employ some concepts of educational psychology.

PSY 310 Learning and Motivation. Preq: PSY 200. 3(3-0) F. Acquaints students with the structure of the areas of learning and motivation and with the major theories and empirical findings in these areas. Develops skill in deriving and testing implications of theories and in manipulating theoretical concepts.
Cole, Newman

PSY 320 Cognitive Processes. Preq: PSY 200. 3(3-0) S. Complex cognitive processes such as: thinking, reasoning, problem solving, creativity and originality, intelligence, social interaction, verbal behavior and decision processes. Emphasis on theoretical approaches, research findings. Aims at developing skills in deriving and testing hypotheses in these areas. Newman

PSY 337 Psychology, Industrial Society, and Social Policy. Preq: PSY 200. 3(3-0) F,S. Current problem areas in human resource development for modern technological societies are considered, emphasizing systems approaches as an unifying concept. General systems concepts, methods of industrial psychology, human resource development and social psychology are jointly introduced and their implications considered. Policy formulation, analysis, implementation, evaluation, feedback, and citizen participation are stressed. An exemplary human resource development system is defined; procedures for analysis, evaluation and for possible design alternatives are explored in the context of modern urban-industrial societies.
Staff

PSY (IE) 338 Human Factors in Equipment Design. Preq: PSY 337 or IE 332. 3(2-2) F. An introduction to methodology in human factors research, equipment design, biomechanics, and accident study. Man's sensory, motor, and decision-making abilities are related to problems of systems design, operator efficiency, and safety as these involve displays, controls, workplace layout, and environmental stressors.

PSY 350 Interviewing and Behavior Observation Skills. Coreqs: PSY 351, 352, SP 231. 4(2-6) F,S. Instruction and practice in interviewing. Developing skill in behavior observation with children of all age levels and with adults, particularly those from disadvantaged and varied cultural backgrounds. Use of communications and instructional media such as video tape, audio tape, and varied observational techniques and instruments.

PSY 351 Instructional Skills. Coreqs: PSY 350, 352, SP 231. 4(2-6) F,S. Development of skills in the psychology of instructing, tutoring, instructional programming, and instructional communication. Emphasis on disadvantaged learners, problems of measurement, evaluation, and test construction.

PSY 352 Organizational Skills. Coreqs: PSY 350, 351, SP 231. 4(2-6) F,S. Topics are: 1) Current theories of organizational structure and process applicable to human serving organizations, 2) problems associated with change and intervention in human serving organizations, 3) recognition and determination of organizational goals, and 4) organizational gaming.

PSY 370 Psychology of Personality and Adjustment. Preq: PSY 200. 3(3-0) F,Sum. Mechanisms influencing human behavior related to crisis resolution, effective adjustment and personal fulfillment. Includes a supervised group interaction laboratory and a major semester problem as well as lectures and examinations.
Norton

PSY 376 Human Growth and Development. Preq: PSY 200 or 304. 3(3-0) F,S. Study of behavioral development during the human life span through 1) studying current theories and 2) working with persons at various stages of the life cycle. Student problems require applications of concepts drawn from developmental psychology. Johnson, Rawls

PSY 400 Perception: Research Methods. Preq: PSY 300; Coreq: ST 311. 3(1-4) F. The various methodologies and research strategies currently employed in the area of perception. Includes extensive individual experience in the perception research laboratory, readings of both methodology and experimental research, and the conduct of an independent project of original design within the area of perception. Mershon

PSY 410 Learning and Motivation: Research Methods. Preq: PSY 310; Coreq: ST 311. 3(1-4) S. The various methodologies and research strategies currently employed in learning and motivation. Includes extensive individual experience in the activities of the Operant laboratory, readings on both methodology and experimental research, and the conduct of an independent project of original design within the area of learning and motivation. Cole

PSY 411 Social Psychology. Preq: PSY 200. 3(3-0) F,S,Sum. A study of the importance of social factors for the behavior of individuals. Topics include affiliation, interpersonal attraction, person perception, attitude formation and change, conformity, and altruistic behavior. Luginbuhl

PSY 420 Cognitive Processes: Research Methods. Preq: PSY 320; Coreq: ST 311. 3(1-4) F. The various methodologies and research strategies currently employed in cognitive processes. Extensive individual experience in the activities of the Cognition Research Laboratory, readings on both methodology and experimental research, and the conduct of an independent project of original design with the area of cognitive processes. Newman

PSY 430 Neuropsychology: Research Methods. Preqs: PSY 400, 410, 420; or CI. 3(1-4) S. The various methodologies and research strategies currently employed in neuropsychology. Includes extensive individual experience in the activities of the Neuropsychology laboratory, and readings on both methodology and experimental research. LeVere

PSY 475 Child Psychology. Preq: PSY 200 or 304. 3(3-0) S. Emphasis upon the intellectual, social, emotional and personality development of the child. Physical growth emphasized as necessary to an understanding of the psychological development of the pupil. Staff

PSY 476 Adolescent Psychology. Preq: PSY 200 or 304. 2(2-0) F,S. Considers adolescent behavior as part of the development sequence of human behavior, with emphasis on the adolescent experience in Western culture. Implications for the instruction of adolescents. Staff

PSY 491, 492 Seminars in Psychology. Preqs: Sr. standing, consent of department. 3(0-3) F,S. Provides the undergraduate psychology major with skill in designing and conducting independent research studies; sources and skill in locating information pertaining to behavior; major trends in selected areas of study, research techniques available to the psychologist, organization of psychology as a profession; the code of ethics for psychologists. Staff

PSY 493 Special Topics in Psychology. Preq: CI. 1-6 S. An individual study course. Any undergraduate student may suggest an activity (review of literature on a topic, designing and conducting an experiment, or survey, etc.). After dis-

cussion if both student and supervising professor agree the topic is worthwhile, that the student is competent to undertake it, the student will enroll the following semester. Staff

PSY 495 Human Resource Development Practicum. Preqs: Jr. standing, PSY HRD option, PSY 350, 351, 352, SP 231. 8(0-8) F,S. Field experience in the use of skills acquired during the skill semester. The student will spend at least a full semester working in a selected off-campus center. The student experiences real-world problems in context, and can arrange his later course work around subjects applicable to the problems solution. Staff

PSY 500 Perception. Preq: Grad. standing. 3(2-2) S. 1) A summary and analysis of the major classes of variables affecting sensation and perception. The data will be examined in the context of the development of theories of perception with emphasis on the general problem of scientific method and theory construction as the specific content of perceptual theory. 2) The major modes of thinking and the variables affecting the thinking process. Emphasis on the relationship between perception and thinking, and a number of the theories of thinking will be evaluated. Newman

PSY 502 Physiological Psychology. Preqs: 12 hours PSY, including PSY 200, 300, 310. 3(3-0) F,S. A survey of the neuroanatomical and neurophysiological mechanisms of behavior with emphasis upon mammalian neuroanatomy, neural conduction, synaptic transmission and reflex mechanisms. Designed to form a basis for advanced study of the neurophysiological requisites of more complex behavioral processes. LeVere

PSY (ZO) 503 Comparative Psychology. Preqs: PSY 310 and BS 100 or CI. 3(3-0) S. The history of comparative behavior study of organisms; methodological verification of theories of behavior. Such topics as operationalism, formalism, ontogeny and evolution of behavior in vertebrate animals. Staff

PSY 504 Advanced Educational Psychology. Preq: Six hours PSY. 3(3-0) S. A critical appraisal of potential contributions of psychology to the analysis and improvement of instruction. Laboratory practice in various applications of psychology to instruction. Staff

PSY 505 History and Systems of Psychology. Preqs: PSY 200, 300, 310, 320 or CI. or grad. status. 3(3-0) S. Acquaints students with the history of psychology and psychological systems and practice in taking different approaches to a particular problem area. Staff

PSY 510 Learning and Motivation. Preq: Grad. standing. 3(3-0) F. A systematic analysis of some major classes of variables determining behavioral change. Learning variables are analyzed within their primary experimental setting. Emphasis is on the diversity of the functions governing behavior change rather than upon the development of some comprehensive theory. Both learning and motivational variables are examined as they contribute to changes in performance within the experimental setting. Staff

PSY 511 Advanced Social Psychology. Preq: Grad. standing or CI. 3(3-0) F,S. A survey of theory and research in social psychology through reading and discussion of primary source materials. Also, issues of methodology, ethical questions in social psychological research, and application of research findings to the world at large. Staff

PSY 514 Logical Foundations of Behavioral Analysis. Preq: Grad. standing in PSY. 3(3-0) F. Analysis of fundamental considerations in the formulation and verification of theories of behavior. Such topics as operationalism, formalism,

reductionism, logical analysis and the nature of truth in empirical sciences are related to research in various areas of psychological interest. Provides insight into the nature of scientific research, fosters ability to derive empirical hypotheses, develops facility in designing experimental tests of hypotheses, and promotes effective writing and speaking about psychological theory and experimentation.
Staff

PSY 520 Cognitive Processes. Preq: Grad. standing. 3(2-2) F,S. An analysis of the individual and the social systems in which he operates. Systems and concepts of personality, the problem of human variability, the development of personality structure and dynamics, and of human motivation. The organization of the individual's perception and attitude structure and their relation to his social roles and group memberships. Processes of conformity, social influence and socialization.
Newman

PSY 530 Abnormal Psychology. Preqs: PSY 200, 302. 3(3-0) S. The causes, symptomatic behavior and treatment of the major personality disturbances. Emphasis on theory, experimental psychopathology and preventive measures. Staff

PSY (ED) 531 Mental Deficiency. 3(3-0) Sum. (See education, page 247.)

PSY 532 Psychological Aspects of Exceptionality. Preq: CI. 3(3-0) F,S. Considers effects of severe deviancy (sensory, physical, mental, etc.) arising from any causes at any stage of life; the personal and social ramifications; and possible courses of intervention. Utilization of psychological theory and clinical information in interpreting probable implications. Research findings related to sensory deprivation, research needs and possible research projects. Rawls

PSY 535 Tests and Measurements. Preq: Six hours PSY. 3(3-0) F,S. The principles of psychological testing including norms and units of measurement, elementary statistical concepts, reliability and validity. Some attention to the major types of available tests such as general intellectual development, tests of separate abilities, achievement tests, measures of personality and interest inventories.
Westbrook

PSY (IE) 540 Human Factors in Systems Design. Preqs: IE (PSY) 338 or IE 354; Coreqs: ST 507 or 515. 3(3-0) S. Problems of the systems development cycle, including man-machine function allocation, military specification, display-control compatibility, the personnel subsystem concept, and maintainability design. Detailed treatment is given to man as an information processing mechanism.
Staff.

PSY 545 Fundamentals of Skill. Preq: Grad. standing. 3(3-0) F. Fundamentals of human perceptual, cognitive, and sensory-motor abilities that are basic to skilled performance. Such topics as channel capacity, short-term memory, stress, fatigue, arousal theory, task taxonomy, skill acquisition, proficiency decrement, information feedback, and performance analysis. Problems of attention, search, monitoring, tracking, complex tasks, and skill maintenance. Pearson

PSY 565 Organizational Psychology. Preq: Nine hours in PSY. 3(3-0) F,S. The application of behavioral science, particularly psychology and social psychology to organizational and management problems. Staff

PSY 570 Theories of Personality. Preq: Grad. standing. 3(3-0) F. A review of theories of personality, with emphasis on research, application in psychotherapy and measurement, and principles involved in similarities and differences among them. Corter

PSY 571 Individual Intelligence Measurement. Preq: PSY 570. 3(3-0) S. A practicum in individual intelligence testing with emphasis on the Wechsler-Bellevue, Stanford-Binet, report writing and case studies. Corter

PSY 575 Behavior Modification. Preqs: Grad. standing, PSY 510 or equivalent; and/or CI. 3(2-2) S. The application of Behavior Modification techniques. Balanced emphasis upon theoretical foundations, ethical considerations, acquisition of skills, and practicum experiences. Methods of applying laws derived from the psychology learning laboratory such as reinforcement schedules, contingency specifications and objective behavioral analyses to the solution of behavioral problems in practical situations. Enrollment limited to 12 students; priority (1) community/clinical and school psychology, (2) other psychology grad. students. Staff

PSY 576 Developmental Psychology. Preqs: Nine hours PSY, including 475 or 476. 3(3-0) S. The development of human behavior, with attention to theoretical issues and research in developmental psychology. Staff

PSY 578 Individual Differences. Preqs: Six hours in PSY. 3(3-0) F. Nature, extent and practical implications of individual differences and individual variation. Graduate Staff

PSY 591 Area Seminar in Clinical-Community Psychology. Preq: CI. 1-3, 6 Maximum F,S. Topics are: 1) the development of clinical community psychology as an area of inquiry, 2) methods of inquiry, 3) contemporary issues, 4) ethical questions, 5) relationships to other areas within psychology. Staff

PSY 592 Area Seminar in Experimental Psychology. Preq: Grad. standing in PSY. 1-3, 6 Maximum F,S. Topics are: 1) the development of experimental psychology as an area of inquiry, 2) methods of inquiry, 3) contemporary issues, 4) ethical questions, 5) relationships to other areas within psychology.

PSY 593 Area Seminar in Human Factors Engineering. Preq: Grad. standing. 1-2, 3 Maximum F,S. Topics are: 1) the development of human factors as an area of inquiry, 2) methods of inquiry, 3) contemporary issues, 4) ethical questions, 5) relationships to other areas within psychology. Staff

PSY 594 Area Seminar in Human Resources Development. Preq: CI. 1-3, 6 Maximum F,S. Topics are: 1) the development of human resources as an area of inquiry, 2) methods of inquiry, 3) contemporary issues, 4) ethical questions, 5) relationships to other areas within psychology. Staff

PSY 595 Area Seminar in School Psychology. Preq: Grad. standing. 1-3, 6 Maximum F,S. Topics are: 1) the development of school psychology as an area of inquiry, 2) methods of inquiry, 3) contemporary issues, 4) ethical questions, 5) relationships to other areas within psychology. Staff

PSY 596 Area Seminar in Social Psychology. Preq: Grad. standing. 1-3, 6 Maximum F,S. Topics are: 1) the development of social psychology as an area of inquiry, 2) methods of inquiry, 3) contemporary issues, 4) ethical questions, 5) relationships to other areas within psychology. Staff

PSY 599 Research Problems in Psychology. Preq: CI. Credits Arranged. F,S. Research project for graduate student supervised by members of the graduate faculty. Research elected on basis of interest of student, not to be part of thesis or dissertation research. Graduate Staff

FOR GRADUATES ONLY

PSY 602 Physiological Psychology. 3(3-0) S.

PSY 603 Verbal Learning and Verbal Behavior. 3(3-0) F,S,Sum.

PSY 604 Classical Conditioning. 3(3-0) F,S.

PSY 605 Instrumental Learning. 3(3-0) F,S.

PSY 607 Advanced Industrial Psychology I. 3(3-0) F.

PSY 608 Advanced Industrial Psychology II. 3(3-0) F.

PSY 610 Theories of Learning. 3(3-0) S.

PSY 611 Social Psychology: Small Groups Research. 3(3-0) F,S.

PSY 635 Psychological Measurement. 3(3-0) S.

PSY (IE) 640 Skilled Operator Performance. 3(3-0) F Alt. years.

PSY 672 Personality Measurement. 3(2-3) F,S.

PSY 674 Psychological Intervention I. 3(2-2) F,S.

PSY 675 Psychological Intervention II. 3(2-2) S.

PSY 690 Seminar in Industrial Psychology. 3(3-0) F,S.

PSY 691 Special Topics in Psychology. 1-3 F,S.

PSY 693 Psychological Clinic Practicum. Maximum 12 F,S,Sum.

PSY 696 Advanced Problems in Perception. 3(2-2) F,S.

PSY (ED) 697 Advanced Seminar in Research Design. 3(3-0) F,S.

PSY 699 Thesis and Dissertation Research. Credits Arranged F,S.

Recreation Resources Administration

FOR UNDERGRADUATES

RRA 152 Introduction to Recreation. 3(3-0) F,S. History and foundations of recreation including objectives, economic and social aspects, definition and importance; status or organized recreation in our modern society; certain applied principles of recreation. Miller

RRA 215 Maintenance and Operation I. Preq: RRA 152. 3(3-0) F,S. Methods of operation of various park and recreation facilities for public use; protection and law enforcement; job planning and scheduling; preventive maintenance; and modern maintenance techniques and maintenance materials. Warren

RRA 216 Maintenance and Operations II. Preq: RRA 152. 3(3-0) F,S. Emphasis upon water-oriented recreation and public camping facilities; swimming pools; beaches; small lake management; marinas; day and family camping. McKnelly

RRA 241 Recreation Resource Relationships. Coreq: FOR 472 or ZO 221. 3(3-0) F,S. The concepts and principles involved in identifying and describing natural recreation resource components significant to management. The relationships

between various governmental agencies and private enterprise in providing forest recreation. Cordell

RRA 353 Public Camp Administration. Preq: RRA 152. 3(2-2) F,S. Development of organized camping and its educational, health and recreational objectives. Program planning and leadership training in community, private, agency and school camping. Laboratory—campcraft skills. Warren

RRA 354 Health Practices in Recreation Management. 3(3-0) F,S. Emphasis upon health problems, disease prevention, communicable diseases and their control, public health administration, school and industrial hygiene, and other health problems confronting the individual and community. Miller

RRA 358 The Recreation Program. Preq: RRA 216. 4(2-4) F,S. Types of recreation opportunities available to individuals, groups, neighborhoods or municipalities and the methods of providing these opportunities. Smith

RRA 359 Recreation and Park Supervision. Preq: RRA 358. 3(2-2) F,S. Directing, inspecting and critical evaluation. Emphasis on the roles of the public recreation supervisor, community centers, sports, special activities, maintenance and operation. Sternloff

RRA 440 Recreation Resources Inventory and Planning. Preq: RRA 241 3(2-2) F,S. Concepts and principles which are a basis for recreation resources quantification and allocation. Factors involved in inventorying the physical properties and associated intangible values of the recreation resource on extensive wildlands. The resource planning function as an essential component of the managerial process. Erickson

RRA 441 Recreation Resources Development. Preq: RRA 241. 3(3-0) F,S. The recreation resource manager's role in situations typical of the Federal, State and private sectors. Categories of information and their significance in the decision-making and problem-solving process. Competent information systems. Erickson

RRA 442 Wildland Recreation Environments. Preq: Jr. standing. 3(2-3) F,S. Environmental modifications and resource developments required to support recreation use. Factors affecting site selection are related to resource planning functions. Site planning procedures provide a basis for managerial review. Natural history interpretation is an element of resource management. Concepts of natural beauty and approaches to preservation of amenities through modified methods of commercial product management. Erickson

RRA 451 Facility and Site Planning. Preqs: RRA 215 and 216. 3(0-6) F,S. The history of park and recreation facility development and trends in recreation facility planning. Emphasis upon the planning principles in design and layout of recreation areas and buildings. Field trips to various types of recreation facilities. McKnelly

RRA 453 Administrative Policies and Procedures. Preq: RRA 359. 3(3-0) F,S. The internal organization of the recreation and park department; the administrative process; legislation and legal foundations; boards and commissions; personnel practices and policies; office management; public relations. Sternloff

RRA 454 Recreation and Park Finance. Preqs: Six hours RRA, Sr. standing. 3(3-0) F,S. Recreation and park fiscal administration; sources of finance for current and capital expenditures; revenue activities; financial planning; budgeting; expenditure policies; accounting; auditing and planning for recreation and park services. Hines

RRA 475 Recreation and Park Internship. Preqs: Sr. standing, RRA 359. 9(0-27) (9 weeks) S,Sum. Provides prospective recreator with an opportunity for controlled experiences in skills and techniques involved in recreation and park department management. The student spends nine weeks off campus in a departmental selected location. Smith

RRA 491 Special Problems in Recreation. Preq: Consent of department. 3(2-2) F,S. Aims to develop critical analysis. Forms a basis for the organization of research projects, for the compilation and organization of material in a functional relationship and for the foundation of policies. Seminar procedure. Miller

FOR GRADUATES ONLY

RRA 500 Theories of Leisure and Recreation. Preq: Nine hours RRA. 3(3-0). Leisure and recreation's origin and development as revealed by man's behavioral patterns. The influence and social significance of leisure and recreation concepts on contemporary American culture and their future implications. Warren

RRA 501 Theory Development in Recreation Research. Preqs: ST 311 and SOC 416. 4(3-2). The historical emphasis of recreation research with analyses of various approaches to research design and model building. The philosophy of social scientific investigation, and possible application of existing behavioral theory to recreation research. Efforts to develop theory useful in explaining use of leisure time. Graduate Staff

RRA 538 Recreation for Special Populations. 3(3-0). The leisure concerns of deprived groups with exposure to the status, problems, and community service needs of special populations found in most American communities. Special populations include the physically disabled, the mentally retarded, the aging, and the economically deprived. Sternloff

RRA 591 Recreation Resources Problems. Preq: Advanced undergrad. or grad. status. 1-4. Assigned or selected problems in RRA planning, supervision, maintenance, operations, financing, or program. Selected on basis of student interest and supervised by graduate faculty members. Graduate Staff

FOR GRADUATES

RRA 691 Seminar in Recreation Administrative Policies. 2(0-4)

RRA 692 Advanced Problems in Recreation. Credits Arranged.

RRA 699 Research in Recreation. Credits Arranged.

Religion

(Also see Philosophy.)

FOR UNDERGRADUATES

REL 300 Introduction to Religion. 3(3-0) F,S. Various aspects of religion are analyzed, such as the development of the great traditions, as well as the relation of religion to personal maturity, cultural change, and the social good. Staff

REL 311 The Hebrew Bible. 3(3-0) F. Man's religious quest is explored in the varied Biblical literature of the Hebrews. The course stresses the development of their religious faith and tradition, but such background matters as geography, archeology, history, and literary problems are also considered. Highfill

REL 312 Christian Origins. 3(3-0) S. The Biblical writings of the early Christian community are examined in their historical context. The results of recent studies of the Dead Sea Scrolls as well as of Hellenistic and Hebrew thought and religion are brought to bear on early Christian life and thought. Highfill

REL 315 Western Religions to the Reformation. 3(3-0) F. This course traces the major steps in the development of Christianity and Judaism during the period 100-1500 A.D., noting the events, persons, and ideas which were most significant in this development. Fitzgerald

REL 316 Western Religions Since the Reformation. 3(3-0) S. This course traces the major developments within Christianity and Judaism from 1500 to the present. Fitzgerald

REL 321 Religion in American Life. 3(3-0) F,S. This is a study of representative men, movements, and thought in the major religions within the context of American society and culture. Staff

REL (ENG) 325 Religion and the Modern Literary Imagination. 3(3-0) F. This course examines the relationship between religion and imaginative literature by exploring in concrete and dramatic form a variety of options on such themes as the problem of evil and suffering and the quest for meaning in human existence. Staff

REL 327 Contemporary Religious Thought. 3(3-0) F,S. Investigates the development of recent religious and theological thought in America and Europe, as it has responded to the rapidly changing intellectual, scientific, and social dimensions of Western culture. Fitzgerald, Stalnaker

REL 331 Hinduism and Islam. 3(3-0) F. The religious traditions of India, including early Vedic religion, Brahamanism, the various Yogas, the devotion cults, the religio-philosophical traditions, and modern religious movements. Islam is examined in its Arabian origins and as it has developed in other parts of the world. Highfill

REL 332 Buddhism. 3(3-0) S. Buddhism is followed from its beginnings in India through the expansion into the whole of Asia. Creativity in art, political involvements, and meditative disciplines, as in Zen, are some of the facets. Highfill

REL 498 Special Topics in Religion. Preq: Six hours REL. 1-6 F,S. This course is used to offer areas of study which appear only rarely in the curriculum. It will also function as a readings course for honors students in religion. Staff

Sociology*

(Also see Anthropology.)

FOR UNDERGRADUATES

SOC 202 Principles of Sociology. 3(3-0) F,S. Introduces basic ideas in the field of sociology. Exposure to a variety of concepts, theories and research findings develops student's abilities to conceptualize, analyze and interpret patterns of human interaction from a sociological perspective.

SOC 203 Social Welfare in the United States. 3(3-0) F,S. Introduction to current social welfare programs in the United States. Examines historical development of these programs including the motivations of individuals and groups which initiated them. Students visit selected programs and explore their philosophies, structures and effectiveness.

SOC 203, 205, 307, 308, 405, 406 and 407 have been redesignated as Social Work courses, carrying a SW designation.

SOC 205 Social Welfare Policies and Issues. Preq: SOC 203. 3(3-0) F,S. Examines policies and issues associated with existing social welfare delivery systems and emphasizes policy formulation and assessment of alternative strategies for establishing and meeting social goals. Influence of social work principles, values and practice on social welfare policies and issues.

SOC 301 Human Behavior. 3(3-0) F,S. Examines effects of social interaction upon individual behavior and personality and collective attitudes and behavior as products of group experience. Analyzes fashions and fads, crowds, mobs, publics, social movements.

SOC 302 Mass Communications and Modern Society. Preq: SOC 202. 3(3-0) F,S. Introduction to the sociology of mass communications including its process, content, audiences, communicators, and social effects in modern society. The preparation of a news media comparison report enables critical examination of local and national media content. Provides insights from classic works by sociologists and other social scientists.

SOC 303 Current Social Problems. 3(3-0) F,S. Examines the concept of social problems with emphasis on the problem orientation of contemporary United States society. Investigates the social and cultural aspects of problems to demonstrate the basic integration of society and community life. Problems for intensive study vary to reflect current interests and may include crime, divorce, race conflict, illness, poverty, housing, recreation, personality adjustment, population and social aspects of environmental crisis.

SOC 304 Contemporary Family Life. 3(3-0) F,S. The American family as a social institution as an interaction process with emphasis on mate selection, marital adjustment, socialization and marital dissolution.

SOC 305 Race Relations. 3(3-0) F,S. Analyzes race relationships both in the United States and throughout the world with emphasis on factors producing current changes.

SOC 306 Criminology. 3(3-0) F,S. The study of the processes whereby behavior is defined as crime and persons are identified as criminals including a sociological investigation of agencies of law enforcement, adjudication, corrections, and prevention; patterns of criminal behavior; explanations of variations in criminality with emphasis on sociocultural and sociopsychological theories.

SOC 307 Social Welfare Programs and Delivery Systems. Preq: SOC 205. 3(3-0) F. An indepth study of major social welfare programs. Focus is on income maintenance programs and social services provided to the aged, families and children, handicapped adults and minority groups. Program content and methods of service delivery explored in class and by small student teams to determine effectiveness of financial and non-financial programs.

SOC 308 Social Work Practice and Methods I. Preq: SOC 307. 3(3-0) F,S. Fundamental elements of an integrated approach to social work practice. Focuses on professional values, social work roles and the social work-client relationships. Skills in interviewing, data collection and case recording are explored and practiced.

SOC 315 Social Thought. Preq: SOC 202 or equivalent. 3(3-0) F,S. The development of social thought from lore to science; historical changes in explanatory systems of human behavior; theories of the individual, group culture, community and society; the emergence of sociological systems of analysis; the role of the sociologist in the study of social phenomena including planned change.

SOC (ED) 318 Introduction to Sociology of Education. Preq: Three hours SOC. 3(3-0) F. Analyzes the school as a social system, roles of the functionaries of education, relationships within the student body, effects of social factors upon the learning experience, reciprocal school-community relationships, adult education and higher education in American society.

SOC 341 Rural Society—U. S. A. Preq: SOC 202 or equivalent. 3(3-0) F,S. Major rural social institutions, ecological patterns and land tenure systems are examined emphasizing the American setting. Influence of rural patterns and values in contemporary urbanized society. Stresses the role of the rural community as an area of institutional functioning and social integration within the framework of a complex, industrial society.

SOC 342 Rural Societies Around the World. Preq: SOC 202 or equivalent. 3(3-0) F,S. Sociological description, analysis and understanding of traditional rural societies of Asia, Africa and Latin America. Basic social institutions, groupings and processes provide bases for understanding these societies in the context of an increasingly urbanized and industrial world. Stresses examination of these societies on a Gemeinschaft-Gesellschaft continuum.

FOR ADVANCED UNDERGRADUATES

SOC 401 Human Relations in Industrial Society. Preq: Sr. standing. 3(3-0) F,S. The sociology of occupations, professions and work especially human relations in industrial plants and other work situations.

SOC 402 Urban Sociology. Preq: SOC 202. 3(3-0) F,S. Analyzes urban social structures emphasizing determinants and consequences of changes in urban places and life styles. Understanding current urban problems as reflecting existing situations and changes occurring in the larger society. Examines various approaches to urban social planning.

SOC 405 Social Work Practice and Methods II. Preq: SOC 308. 3(3-0) F,S. Examines the strategies of study, evaluation and intervention utilized in social work practice in the beginning, core and ending phases of the social worker-client, problem solving relationship.

SOC 406 Field Work I. Preq: SOC 405. 6(2-16) F,S. Supervised field experience in a social welfare agency or program for two full days each week. Assigned participation in an agency or program operation includes interaction with individuals, small groups, and agency staff. Provision for application of social work values, skills, objectives and methods gained in class. A two hour seminar on campus each week will link social work theory with field experience.

SOC 407 Field Work II. Preq: SOC 406. 6(2-16) F,S. Supervised field experience in a social welfare agency or program for two days each week and a two hour weekly seminar enables the student to increase and refine professional social work skills and knowledge. Seminars focus on integration of content areas of the curriculum with field practice. Faculty liaison with field instructors and students on a regular basis.

SOC 411 Community Relationships. Preq: SOC 202. 3(3-0) F,S. A survey of the institutions, organizations and agencies found in modern communities; social problems and conditions with which they deal; their interrelationship and the trend toward over-all planning.

SOC 414 Social Ranking. Preq: SOC 202. 3(3-0) F,S. An introduction to the study of structured inequality, including the universality, bases, causes and con-

sequences of ranking. Concentrates on imparting existing knowledge about a special type of ranking, social class, and its relationship to life chances, life styles, and mobility. Theories and research methods pertinent to social ranking.

SOC 416 Research Methods. Preqs: Sr. standing, ST 311. 3(3-0) F,S. The basic methods of social research, research design sampling, data collection, measurement, and analysis; the relation of theory and research.

SOC 418 Analysis of School-Community Relations. Preqs: SOC 202, or 318, or 411, or ED 344. 3(2-2) S. Analyzes the reciprocal relations of school and community, the variant effect of influence sources, and consequences for both school and community. Systemic characteristics and relationships, social change, values, social processes and the American community constitute key analytical variables, implemented by student laboratory experience in school and community.

SOC 425 Juvenile Delinquency. Preq: SOC 306 or six hours social science. 3(3-0) F,S. Explores epidemiology of juvenile delinquency. Compares descriptive typologies. Develops theories of causation with emphasis on social institutions, peer groups and socialization processes. Investigates procedures for enforcement, adjudication and correction of young offenders. Examines strategies for prevention of delinquency. Opportunities for observation and participation in agency operations.

SOC 451 Population and Public Affairs. Preq: SOC 202 or equivalent. 3(3-0) F,S. Growth rates, changing composition and residential redistribution in relation to public issues and planning. Studies the ways in which population data are utilized by public agencies in program and policy formulation. Analysis encompasses new problems and socioeconomic situations resulting from the dynamic nature of population changes in contemporary society.

SOC 490, 491 Senior Seminar in Sociology. Preq: Consent of department. 3(3-0) F,S. Affords an opportunity to synthesize knowledge, theory and methods learned in earlier courses and to conduct original explorations in special interest areas.

SOC (PS) 494, 495 Urban Seminar. 3(3-0) F,S. (See politics, page 345.)

SOC 498 Special Topics in Sociology. Preq: Six hours SOC above the freshman level. (1-6) F,S. A detailed investigation of a topic in sociology or anthropology. Topic and mode of study determined by the faculty member(s) in consultation with the departmental head.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

SOC (ED) 501 Leadership. Preq: SOC 202 or equivalent. 3(3-0) F,S. Leadership in various fields of American life; analysis of factors associated with it; techniques of leadership. Stresses recreational, scientific and executive leadership procedures.

SOC 502 Society, Culture and Personality. Preq: SOC 202 or equivalent. 3(3-0) F,S. Studies human personality from its origins in primary groups through its development in secondary contacts and its ultimate integration with social norms. Explores comparative anthropological materials but places emphasis on the normal personality and individual adjustment to our society and culture. Dynamics of personality and character structure analyzed in terms of society's general culture patterns and social institutions.

SOC 503 Contemporary Sociology. Preq: Grad. standing. 3(3-0) F,S. An overview of the current status of sociological theory and research. Introduction to contemporary sociological thinking and research.

SOC 504 Education in Modern Society. Preqs: SOC 202, 301 or equivalent. 3(3-0) F,S. Places varying emphasis on the historical development of education in the United States, cross-cultural comparisons of educational structure and function, professionalization of educators, investigation of the ecological factors affecting education, effects of group processes upon learning, and the effects of social processes and changes upon the educational institution.

SOC 505 The Sociology of Rehabilitation I. Preq: Grad. standing and/or CI. 3(3-0) F. The area of disability and handicap is introduced from a conceptual and theoretical standpoint. Sociological and social-psychological aspects of handicaps, the rehabilitation processes and rehabilitative organizations are stressed. Emphasizes rehabilitation of the sociology of work in the rehabilitation processes. Socio-cultural factors in disability and handicap (residence, social class, family relationships, etc.) are analyzed.

SOC 506 The Sociology of Rehabilitation II. Preq: Grad. standing and/or CI. 3(3-0) S. Students engage in individual research projects on a specific handicap, a rehabilitation process or a rehabilitative agency or subagency. Lectures and discussions furnish perspective concerning rehabilitation work in process while student pursues a specialized interest. Emphasizes sociological methods and techniques applicable to above aspects of social behavior.

SOC 509 Population Problems. Preq: SOC 202 or equivalent. 3(3-0) F,S. Examines population growth, rates of change and distribution. Emphasizes functional roles of population, i.e., age, sex, race, residence, occupation, marital status, and education. Population dynamics are stressed: fertility, mortality and migration. Population policy is analyzed in relation to national and international goals stressing a world view.

SOC 510 Industrial Sociology. Preq: SOC 202 or equivalent. 3(3-0) F,S. Industrial relations are analyzed as group behavior with a complex and dynamic network of rights, obligations, sentiments and rules. This social system is viewed as an interdependent part of total community life. The background and functioning of industrialism are studied as social and cultural phenomena and its social problems are analyzed.

SOC 511 Sociological Theory. Preqs: Six hours SOC and grad. standing or CI. 3(3-0) F,S. The interdependence of theory and method; the major theoretical and methodological systems. Examines selected cases of research in which theory and method are classically combined.

SOC 512 Family Analysis. Preq: SOC 202 or equivalent. 3(3-0) F,S. Examines the basic theoretical and methodological framework in sociology within which contemporary family research is conducted.

SOC (ED) 513 Community Organization. Preq: SOC 202 or equivalent. 3(3-0) F. Community organization is viewed as a process of bringing about desirable changes in community life. Community needs and resources are studied. Democratic processes in community action and principles of organization are stressed, along with techniques and procedures. Roles of lay and professional are analyzed.

SOC 514 Developing Societies. Preq: Six hours SOC or ANT or grad. standing. 3(3-0) S. Defines major problems posed for development sociology and explores the social barriers and theoretical solutions for development set forth with regard to the newly-developing countries. Significant past strategies reviewed and main themes in current development schemes presented. Untested strategies for the future proposed and discussed. These problems are examined in their national and international contexts.

SOC 515 Deviant Behavior. Preq: Six hours SOC or ANT or grad. standing. 3(3-0) S. Topics include: the inevitability of deviance and its social utility; cross-cultural variations in appearance and behavioral cues for labeling the deviate; descriptive and explanatory approaches to kinds and amounts of deviance in contemporary American society; social change, anomie and social disorganization theories; the process of stigmatization; formal and informal societal responses to deviance and the deviate; social action implications.

SOC (PS) 517 The Police Bureaucracy in a Democratic Society. 3(3-0) F,S. (See politics, page 347.)

SOC 523 Sociological Analysis of Agricultural Land Tenure Systems. Preq: Three hours SOC. 3(3-0) F. A systematic sociological analysis of the major agricultural and land-tenure systems of the world with emphasis on problems of U.S. family farm ownership and tenancy.

SOC 533 Theory of Human Communication Behavior. Preq: Six hours SOC or social psychology and grad. standing. 3(3-0) F,S. The behavioral science approach to understanding human communication which is treated as a basic social psychological process in which communication events are analyzed in terms of their effects on individual, interpersonal and group behavior. Surveys theory, research methods and empirical findings. Communication behavior as a mediating mechanism in social interaction.

SOC 534 Agricultural Organizations and Movements. Preqs: Three hours SOC, American history, American government or a related social science or consent of department. 3(3-0) F,S. A history of agricultural organizations and movements in the United States and Canada principally since 1865, emphasizing the Grange, the Farmers' Alliance, the Populist revolt, the Farmers' Union, the Farm Bureau, the Equity societies, the Nonpartisan League, cooperative marketing, government programs and present problems.

SOC 541 Social Systems and Planned Change. Preq: Three hours SOC. 3(3-0) F,S. An examination of social systems within the framework of both functional theory and conflict theory, with particular emphasis upon system change and the planning of social change.

SOC 555 Social Stratification. Preq: Six hours SOC. 3(3-0) F,S. The theoretical background, methodological approaches, and analysis of the consequences of systems of stratification. Emphasizes the static and dynamic qualities of stratification systems on relations within and between societies. Attention to the integrative and divisive quality of stratification as it is expressed in life styles, world views, etc.

SOC 560 Racial and Cultural Contacts. Preq: Six hours SOC or CI. 3(3-0) F,S. 1) Examines intergroup relations as a legitimate concern of the social sciences, 2) Appraises cross-cultural data drawn from a variety of situations wherein race and ethnicity figure in a significant manner, 3) Attempts to interpret data by delineating observable patterns, trends and relationships.

SOC 565 Sociology and General Systems Theory. Preqs: Six hours SOC, one ST course. 3(3-0) F,S. Examines the basis of general systems theory and its application in the sociological fields. Emphasizes the philosophical nature of systems theory and its potential as an alternative conceptualization to mechanistic and organismic models. Scrutinizes the underlying basis of systems theory; cybernetics as models of change and control; learning and equilibrium; information theory as models of choice and selection; decision theory, and game theory.

SOC 570 Commitment. Preq: Six hours SOC. 3(3-0) F. The process of commitment and its strength are covered from several theoretical views as applicable to collective behavior, social movements, the sociology of religion, political sociology, deviance, attitudes, decision making, dissonance, structural effects and other topics. An aim is to construct propositions and testable models of the commitment process.

SOC (EC) 574 The Economics of Population. 3(3-0) S. (See economics, page 239.)

SOC 590 Applied Research. Preq: SOC 202 or equivalent. 3(3-0) F,S. Studies research process with emphasis upon its application to action problems. The development of research design to meet action research needs is stressed.

SOC 591 Special Topics in Sociology. Preq: CI. 1-6 F,S. An examination of current problems organized on a lecture-discussion basis. Course content varies as changing conditions require new approaches to emerging problems.

SOC 592 Demographic Structure and Processes. Preq: SOC 509 or equivalent. 3(3-0) S. Explores in depth, the major demographic variables (size, composition and distribution) and basic demographic processes (fertility, mortality and migration). Attention to theoretical and methodological considerations as well as to current substantive knowledge. Specific course content varies depending upon student needs and interests.

FOR GRADUATES ONLY

SOC 601 Urban Ecology. 3(3-0) S.

SOC 611 Research Methods in Sociology. 3(3-0) F.

SOC 613 Theory of Mass Communication. 3(3-0) S.

SOC 615 Research on Crime and Deviance. 3(1-2) S.

SOC 621 Social Psychology. 3(3-0) S.

SOC 631 Population Analysis. 3(3-0) S.

SOC 632 Sociology of the Family. 3(3-0) S.

SOC 633 The Community. 3(3-0) S.

SOC 641 Statistics in Sociology. 3(3-0) S.

SOC 645 Advanced Sociological Measurement. 3(3-0) S.

SOC 646 Advanced Sociological Analysis. 3(3-0) S.

SOC 652 Comparative Societies. 3(3-0) S.

SOC 653 Theory and Development of Sociology. 3(3-0) S.

SOC 670 Theories of Population. 3(3-0) F.

SOC 671 Social Demography. 3(3-0) S.

SOC 690 Seminar. Credits Arranged F,S.

SOC 699 Research in Sociology. Credits Arranged F,S.

Soil Science

FOR UNDERGRADUATES

SSC (CS) 112 Perspectives in Agronomy. 2(0-5) S. (See crop science, 231.)

SSC 200 Soil Science. Preqs: CH 103 or 107; GY 120 recommended. 4(2-4) S. Fundamentals including origin, composition and classification of soils; their physical, chemical, and biological properties; significance of these properties to soil-plant relationships and soil management. For SSC students and those in allied fields. Cook

SSC 205 Soils as a Natural Resource. Preq: CH 101 or 111. 3(2-3) F. Emphasis on soil as an important component in natural resource use and planning; characteristics and properties of soils as related to natural resources; impact of technological advances and soil use on environmental quality. Primarily for majors in fields not closely allied with SSC. Sopher

SSC (BAE) 321 Irrigation, Terracing and Erosion Control. 3(2-3) F. (See biological and agricultural engineering, page 207.)

SSC 341 Soil Fertility and Fertilizers. Preq: SSC 200, BS 100. 3(3-0) F. Plant nutrition and growth as related to crop fertilization; fertilization materials, their manufacture, properties and usage; fertilizer practices for a sound management program. Kamprath

SSC 342 Soil Fertility Laboratory. Coreq: SSC 341. 1(0-3) F. Applications of soil fertility principles in plant growth; laboratory and greenhouse exercises in soil and plant tissue testing; written reports of observations and their interpretation. Watson

SSC 352 Soil Classification. Preq: SSC 200. 4(2-5) S. Morphology and diagnostic properties of soils; characterization of selected North Carolina soils and their placement in the modern soil classification system; practical field problem in soil identification and mapping. Field trips. Cook, Phillips

SSC 361 Soil Resources and Land Use. Preq: SSC 200 or 205. 3(2-3) F. Factors important to the interpretation of soils information for land use with emphasis upon soil profile properties. Planning of land areas using soil maps; practical field problems in soils interpretation for various uses. Staff

SSC 461 Soil and Water Conservation. Preq: SSC 200 or equivalent. 3(3-0) F. Effects of soil structure, water, aeration and temperature upon plant growth; role of climate as it modifies soil physical properties. Cassel

SSC (CS) 462 Soil-Crop Management Systems: Preqs: CS 211, 414, SSC 341, 352. 3(2-3) S. Unites principles of soil science and crop science with those of allied areas into realistic agronomic applications; practical field studies in planning and evaluation of soil and crop management systems. Sopher, Fike

SSC (BAE) 471 Agricultural Water Management. 4(3-2) F. (See biological and agricultural engineering, page 208.)

SSC 472 Forest Soils. Preq: SSC 341, or FOR 452. 3(2-3) S. Soil as a medium for tree growth; the relation of soil physical, chemical, and biological factors to the practice of silviculture; extensive soil management in the forest and intensive soil management in forest nurseries and in seed-tree orchards; the relation of soil and site to forest genetics, ecology, pathology, and entomology. Wollum

SSC 492 Senior Seminar in Soil Science. Preq: Sr. standing in Agriculture and Life Sciences. 1(1-0) S. Students prepare and present thorough and documented discussions of important soil topics. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

SSC 501 Tropical Soils: Characteristics and Management. Preqs: Six credits SSC. 3(3-0) F. Characteristics of the tropical environment: distribution and classification of tropical soils; soil-plant relationships in the tropics; soil management systems emphasizing shifting cultivation, flooded rice production, subsistence farming and tropical pasture management. Sanchez

SSC 511 Soil Physics. Preqs: PY 212, SSC 200. 4(3-3) F. Physical properties of soils and their measurement; theory and mechanics of transport of water, air, heat and solutes. Cassel

SSC 520 Soil and Plant Analysis. Preqs: PY 212, CH 315, at least three SSC courses including SSC 341, or CI. 3(1-6) S. Theory and advanced principles of the utilization of chemical instruments to aid research on the heterogeneous systems of soils and plants. Gilliam

SSC 522 Soil Chemistry. Preqs: SSC 200, one year of general inorganic chemistry. 3(3-0) S. The chemical and colloidal properties of clay and soil systems, including ion exchange and retention, soil solution reactions, solvation of clays and electro-kinetic properties of clay-water systems. Weed

SSC (MB) 532 Soil Microbiology. Preqs: MB 401, CH 220 or CI. 4(3-3) S. Soil as a medium for microbial growth, the relationships and significance of microbes to mineral tranformations in soil, biological equilibrium, and environmental quality. Wollum

SSC 541 Soil Fertility. Preq: SSC 341. 3(3-0) F. Soil conditions affecting plant growth and the chemistry of soil and fertilizer interrelationships. Factors affecting the availability of nutrients. Methods of measuring nutrient availability. Kamprath

SSC 551 Soil Morphology, Genesis and Classification. Preqs: GY 120, SSC 200, 341. 3(3-0) F. Concepts of soil horizons and soil profiles and chemical, physical and mineralogical parameters useful in characterizing them. Soil-forming factors and processes. Evaluation of historical development and present concepts of soil taxonomy with particular reference to great soil groups and discussion of logical basis of soil classification. Buol

SSC 553 Soil Mineralogy. Preqs: SSC 200, 341, and GY 330. 3(2-3) F. Composition, structure, classification, identification, origin occurrence and significance of soil minerals with emphasis on primary weatherable silicates, layer silicate clays and sesquioxides. Cook

SSC 560 Advanced Soil Management. Preqs: SSC 200, 341. 3(3-0) Sum. Characteristics related to management of soil in the coastal plain, Piedmont and mountain areas of North Carolina. Field trips. Management practices that should be associated with various soils for different types of enterprises. (Offered Sum. 1975, and alt. years.) Cook, Kamprath, Phillips

SSC 590 Special Problems. Preq: SSC 200. Credits Arranged. F,S. Problems in various phases of soils with emphasis on recent and current research. Graduate Staff

FOR GRADUATES ONLY

SSC (CS, HS) 614 Herbicide Behavior in Plants and Soils. 3(3-0) F, 1975 and Alt. years.

SSC 622 Soil Physical Chemistry. 3(3-0) S, 1975, Alt. years.

SSC (MB) 632 Ecology and Functions of Soil Micro-Organisms. 3(3-0) S, 1975, Alt. years.

SSC 651 Pedology. 3(3-0) F, 1975, Alt. years.

SSC (BAE) 671 Theory of Drainage: Saturated Flow. 3(3-0) F, 1976, Alt. years.

SSC 672 Soil Properties and Plant Development. 3(3-0) S, 1976, Alt. years.

SSC (BAE) 674 Theory of Drainage: Unsaturated Flow. 3(3-0) S, 1975, Alt. years.

SSC 690 Seminar. 1(1-0) F,S.

SSC 693 Colloquium in Soil Science. Credits Arranged, F,S.

SSC 699 Research. Credits Arranged, F,S.

Speech-Communication

(Also see English.)

NOTE: The prerequisite for all courses in speech is the completion of ENG 111 and 112.

FOR UNDERGRADUATES

SP 210 Voice and Articulation. 3(3-0) F,S. Basic processes of speech production. Attention to student's voice quality, articulation, pronunciation and general vocal expression. Speech improvement; help in recognition and reduction of excessive regional substandard dialect. Elective for general student; required by School of Education. (Meets requirement of the N.C. Department of Public Instruction for certification of speech proficiency for teachers in *all fields*, except speech. SP 310 required for speech teachers.) Staff

SP 231 Expository Speaking. 3(3-0) F,S. Basic theories of informative, report and instructional speaking. Delivery of short expository speeches. Emphasis on basic rhetorical, audience, and idea analyses. Staff

SP 232 Persuasive Speaking. 3(3-0) F,S. Principles of influencing attitudes and actions through persuasive speaking. Emphasis upon short speeches to stimulate, convince and actuate. Staff

SP 237 Group Discussion. 3(3-0) F,S. Theory and practice of leading and taking part in panels, forums, symposiums, conferences and committees. Staff

SP 238 Interpersonal Communication. 3(3-0) F,S. Verbal and non-verbal communication theory resulting in practical experiences in intrapersonal, interpersonal, small group, and public communication. Strives toward improvement of personal effectiveness and fulfillment of individual potential through oral communication. Staff

SP 310 Phonetics. 3(3-0) F,S. Anatomy and movement of the vocal organs in production of speech sounds. Application of International Phonetic Alphabet to standards of American pronunciation. Study of major dialect areas of the United States. Recommended as elective for English majors. Parker, Franklin

SP 311 Introduction to Speech Correction. Preq: SP 310. 3(3-0) S. A study of the development of normal speech and hearing. Common speech and hearing defects; basic techniques for their prevention and treatment. Franklin

SP 332 Argumentation and Debate. 3(3-0) F. The process of influencing opinion through use of logical arguments, with emphasis upon analysis, briefing, evidence, reasoning, and refutation. In-class debating. Attaway, Camp

SP 336 Parliamentary Practice. 3(3-0) F,S. Rules and customs of assemblies, including organization, motions; participation in and conduct of meetings; parliamentary strategy. Camp, Parker

SP 340 Introduction to the Theatre. 3(3-0) F,S. Methods and techniques of staging dramatic art. Organizing, play selection, casting, directing, acting, scene designs and construction, lighting. Martin

SP 350 Fundamentals of Radio Broadcasting. 3(2-2) F. Audio production course. Laboratory work suitable for both inexperienced and advanced students. Lectures, discussions and demonstrations arranged to examine elements of advertising, business, engineering, journalism, politics and show business relevant to American radio broadcasting. Malcolm

SP 351 Radio Production. Preq: SP 350 or CI. 3(2-2) S. Advanced course in writing and production. Copy writing, news writing and more complex writing assignments lead to recorded individual "special" program which is evaluated by instructor and by class. Best programs may be broadcast over area radio stations. Malcolm

SP 361 Oral Reading. 3(3-0) F,S. Analysis and presentation of printed materials —literary, technical and semitechnical—for platform, radio and television. Franklin, Camp

SP 420 Development of Rhetorical Theory. 3(3-0) F,S. Development through the Greek, Roman, Medieval, Renaissance and modern periods. Camp

SP 430 History and Criticism of American Public Address. 3(3-0) F,S. Significant political and social speakers in America from colonial times to present. Analyses of the social settings, of the speeches themselves, and of their impact upon American history. Camp

SP 450 Fundamentals of Television Production. 3(1-4) F. Philosophy and techniques of television production, particularly instructional and informational programming. Lectures consider television as a communication medium in contemporary society. Laboratory sessions involve the student in studio production of 30-minute television programs. The term project requires each student to "structure," produce and direct a 30-minute program for taping and critique by teacher, professionals and class. Malcolm

SP 451 Advanced Television Production. Preq: SP 450 or CI. 3(2-2) S. For speech-communication majors, teacher trainees and others of advanced standing who already have general knowledge about operation and basic function of media. Lect.—Theories of media and message. Lab.—Evaluation and analyses of student productions. Malcolm

SP 496 Seminar in Speech Communication. Preq: Consent of department. 3(3-0) F,S. Research-oriented study of major periods, movements and personalities in oral communication. Encourages student to synthesize aspects of preceding work in speech. Staff

SP 498 Special Topics in Speech. Preq: Nine hours of speech. 1-6 F,S. Detailed investigation of topic in communication arts or sciences. Topic and mode of study determined by the faculty member in consultation with speech division head. Staff

Statistics

FOR UNDERGRADUATES

ST 311 Introduction to Statistics. 3(3-0) F,S. Relates general statistical concepts to everyday life and emphasizes giving perspective to those concepts: quantitative descriptions of populations, some sampling ideas, techniques of making inferences from samples, and the uncertainties involved in making statistical inferences. Hafley, McVay, Stines

ST 361 Introduction to Statistics for Engineers. Preq: College algebra. 3(3-0) F,S. Statistical techniques useful to engineers and physical scientists. Includes elementary probability, frequency distributions, sampling variation, estimation of means and standard deviations, confidence intervals, significance tests, elementary least squares curve fitting. Staff

ST 371 Introduction to Probability and Statistics. Preq: MA 201. 4(4-0) F,S. Basic concepts for students in the physical sciences and engineering; simple probability models, random variables, distributions, functions of random variables, sampling, data description, testing hypotheses, estimation; simple applications of concepts; tests of means, variances, goodness-of-fit, randomness, control charts, analysis of variance, regression. Grandage, Manson, Quesenberry

FOR ADVANCED UNDERGRADUATES

ST 421, 422 Introduction to Mathematical Statistics. Preqs: MA 202 or 212 or 232. 3(3-0) F,S. Elementary mathematical statistics primarily for students not intending to take further work in theoretical statistics. Includes introduction to probability, common theoretical distributions, moments, moment generating functions, sampling distributions, estimation, hypothesis testing concepts, decision theory concepts and elements of general linear model theory. Giesbrecht, Gallant

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ST 501, 502 Basic Statistical Analysis. Preq: ST 311 or equivalent or grad. standing. 3(3-0) F,S. Basic concepts; random variables, distributions, statistical measures, estimation, tests of significance, analysis of variance, elementary design and sampling, factorial experiments, multiple regression, analysis of discrete data and other topics. Primarily for statistics majors and Ph.D. minors; not a service course. Steel

ST 507 Statistics for the Behavioral Sciences I. 3(3-0) F. A general introduction to descriptive and inferential statistics. Investigates the role of statistics in behavioral science research as well as presenting the techniques and principles for summarizing data. Basic inferential statistics with emphasis on the concepts of hypothesis testing and decision making. Principles and methods illustrated by examples and problems from behavioral science. Wasik, Monroe

ST 508 Statistics for the Behavioral Sciences II. Preq: ST 507 or CI. 3(3-0) S. Further consideration of advanced statistical techniques used in decision making in behavioral science research. Hypothesis testing and analysis of variance procedures used in the design of experiments. Part of the course devoted to topics relating to least squares and multiple regression analysis. Wasik

ST 511 Experimental Statistics for Biological Sciences I. Preq: ST 311 or grad. standing. 3(3-0) F,S. Basic concepts of statistical models and use of samples; variation, statistical measures, distributions, tests of significance, analysis of variance and elementary experimental design, regression and correlation, chi-square. Staff

ST 512 Experimental Statistics for Biological Sciences II. Preq: ST 511 or equivalent. 3(3-0) F,S. Covariance, multiple regression, concepts of experimental design, factorial experiments, individual degrees of freedom, confounded factorial and split-plot designs. Staff

ST 513 Experimental Statistics for Social Sciences I. Preq: ST 311 or grad. standing. 3(3-0) F. Basic concepts in collection and analysis of data. Variability of sample data, distributions, confidence limits, chi-square, t-test, analysis of variance, regression, correlation, analytic and descriptive surveys, experimental designs. McVay

ST 514 Experimental Statistics for Social Sciences II. Preq: ST 513 or equivalent. 3(3-0) S. Extension of basic statistical concepts to social experiments and surveys; sampling from finite populations and estimating using unrestricted, stratified, systematic and multistage selections; analysis of variance continued; multiple regression; covariance; experimental designs. Proctor

ST 515, 516 Experimental Statistics for Engineers. Preq: ST 361 or grad. standing. 3(3-0) F,S. General statistical concepts and techniques useful to research workers in engineering, textiles, wood technology, etc. Probability, distributions, measurement of precision, simple and multiple regression, tests of significance, analysis of variance, enumeration data, sensitivity data, life-testing experiments and experimental designs. Hader

ST 517 Applied Least Squares. Preq: ST 502 or equivalent. 3(3-0) F. Use of least squares estimation in developing numerical descriptions with linear models. Regression, analysis of variance and covariance considered in a unified manner that requires no extensive statistical background. Emphasis on application of these techniques to experimental situations and broadening the range of problems to which they can be applied (particularly in terms of unequal numbers). Computer used for some problems such as matrix inversion. Staff

ST 521 Statistical Theory I. Coreq: MA 425 or 511 and MA 405 or CI. 3(2-2) F. The use of statistics as illustrated by an example, pointing out the need for a probabilistic framework. The probability tools for statistics: description of discrete and absolutely continuous distributions, expected values, moments, moment generating functions, transformation of random variables, marginal and conditional distributions, independence, order statistics, multivariate distributions, concept of random sample, derivation of many sampling distributions. van der Vaart

ST 522 Statistical Theory II. Preq: ST 521; Coreq: MA 426 or 512. 3(2-2) S. General framework for statistical inference. Point estimators: biased and unbiased, minimum variance unbiased, least mean square error, maximum likelihood and least squares, asymptotic properties. Interval estimators and tests for hypotheses: confidence intervals, power functions, Neyman-Pearson lemma, likelihood ratio tests, unbiasedness, efficiency and sufficiency. van der Vaart

ST 531 Design of Experiments. Preq: ST 502 or equivalent. 3(3-0) F. Review of completely randomized, randomized complete block and Latin square designs, and the basic concepts in the techniques of experimental design. Designs and analysis methods in factorial experiments, confounded factorials, response surface methodology, change-over design, split-plot experiments and incomplete block designs. Examples illustrate application and analysis of designs. Monroe

ST (MA) 541 Theory of Probability I. 3(3-0) F. (See mathematics, page 306.)

ST (MA) 542 Theory of Probability II. 3(3-0) S. (See mathematics, page 306.)

ST 552 Basic Theory of Least Squares and Variance Components. Preqs: MA 405, ST 521; Coreq: ST 522. 3(2-2) S. Theory of least squares; multiple regression; analysis of variance and covariance; experimental design models; factorial experiments; variance component models. Grandage

ST (EC) 561 Intermediate Econometrics. 3(3-0) S. (See economics, page 239.)

ST (BMA, MA) 571 Biomathematics I. 3(3-0) F. (See biomathematics, page 210.)

ST (BMA, MA) 572 Biomathematics II. 3(3-0) S. (See biomathematics, page 210.)

ST 581 Introduction to Nonparametric Statistics. Preq: ST 522. 3(3-0) F. Treats both theoretical and methodological material relevant to inference problems arising when sampling is from a parent family that is not assumed to have a particular functional form. Concentrates on inference problems for the absolutely continuous family of distributions. (Offered F 1974 and alt. years.) Quesenberry

ST 583 Introduction to Statistical Decision Theory. Preq: ST 522. 3(3-0) F. The theory of statistical inference discussed from a unified decision theoretic point of view and its relationship with the zero-sum two person game. Develops techniques of statistical analysis using Bayesian approach. Major emphasis on solution of problems using decision theoretic concepts. (Offered F 1975 and alt. years.) Bhattacharyya

ST 591 Special Problems. 1-3 F,S. Development of techniques for specialized cases, particularly in connection with thesis and practical consulting problems. Staff

FOR GRADUATES ONLY

ST (MA, OR) 606 Mathematical Programming II. 3(3-0) S.

ST 613 Time Series Analysis I. 3(3-0) S.

ST 614 Time Series Analysis II. 3(3-0) F.

ST (MA) 617, 618 Measure Theory and Advanced Probability. 3(3-0) F,S.

ST (MA) 619 Topics in Advanced Probability. 3(3-0) Sum.

ST 621 Statistics in Animal Science. 3(3-0) F.

ST (ANS) 622 Principles of Biological Assays. 3(3-0) S.

ST 623 Statistics in Plant Science. 3(3-0) F.

ST (GN) 626 Statistical Concepts in Genetics. 3(3-0) S.

ST 631 Theory of Sampling Applied to Survey Design. 3(3-0) F.

ST 637 Advanced Statistical Inference. 3(3-0) S.

ST (EC) 651 Econometrics. 3(3-0) F.

ST (EC) 652 Topics in Econometrics. 3(3-0) S.

ST 671 Advanced Analysis of Variance and Variance Components. 3(3-0) S.

ST 674 Advanced Topics in Construction and Analysis of Experimental Designs. 3(3-0) S.

ST 682 Statistical Analysis for Linear Models. 3(3-0) F.

ST 691 Advanced Special Problems. 1-3 F,S.

ST 694 Seminar. 1(1-0) F,S.

ST 699 Research. Credits Arranged F,S.

Textile Chemistry

FOR UNDERGRADUATES

TC 301 Technology of Dyeing and Finishing. Preqs: T 203, 250. 4(3-2) F,S. For TX students. The basic principles involved and the procedures used for the preparation, dyeing, printing and finishing of natural and man-made fibers. Some emphasis on the chemical nature of dyes and fastness properties, and the chemical nature of finishes used to impart specific end-use properties. Livengood

TC 303, 304 Textile Chemistry I, II. (303) Preq: Soph. standing or equivalent. 2(2-0). (304) Preq: TC 303. 2(1-3) F,S. The physical and chemical phenomena which occur in the preparation and finishing of textile materials. Emphasis on general principles, rather than detailed technical procedures. TC 304 is a natural continuation of this course. McGregor

TC 401 Textile Industry and the Environment. Preq: CI. 3(3-0) S. The concept of water quality management, criteria of pollution, sources of pollution from fabric processing, plant surveys and in-plant remedial measures, principles of biological oxidation, current waste-treatment practices, and new developments and trends in pollution control. Emphasis is on textile industry wastes, with introduction to the broader aspects of environmental pollution. Bryan

TC 403, 404 Textile Chemical Technology. (403) Coreq: CH 223; (404) Preq: TC 403. 3(3-0) F,S. The chemistry involved in the wet processing of fibrous systems, especially dyeing, printing and finishing. Emphasizes principles and includes a study of the various classes of dyes and their application to all important textile fibers and blends of fibers; preparatory and bleaching processes, roller printing and print formulations for important dye classes; nature and application of finishes for textiles. Campbell

TC 405, 406 Textile Chemical Technology Laboratory. Preqs: TC 403, 404. 2(0-6) F,S. To be taken concurrently with TC 403, 404. Campbell

TC 411 Textile Chemical Analysis I. Preq: TC 301. 3(2-2) S. A survey of textile chemicals, emphasizing surfactants, warp sizes and fabric finishes of all types: the

identification of fibers by chemical means; the qualitative and quantitative analysis of fiber blends by chemical means, the identification of finishes, the evaluation techniques for dyed and finished materials. (Not available to TC majors.) Livengood

TC 412 Textile Chemical Analysis II. Preq: CH 315. 3(2-3) S. Applying techniques of analysis to fibers, textile chemicals and textile processes, ultraviolet, visible and infrared spectrophotometry; thin-layer and gas chromatography, viscometry; interfacial tension; calorimetric, gravimetric and mechanical thermal analyses. Using these techniques to solve problems of analysis involving such processes as sorption, solution, diffusion, crystallization, etc. Cates

TC (CH) 461 Chemistry of Fibers. Preq: CH 223. 3(3-0) F. Lectures emphasize: the formation and properties of fiber-forming polymers; addition and condensation polymerization; theories of fiber structure, the relationship between the chemical structure and physical properties of natural and man-made fibers; the production of man-made fibers. Gilbert

TC 490 Special Topics in Textile Chemistry. 1-6 F,S. Topics relate to current developments in textile and polymer chemistry. Staff

TC 491 Seminar in Textile Chemistry. Preq: TC 403. 1(0-2) S. Familiarizes student with the principal sources of TC literature and emphasizes importance of keeping abreast of developments in the field. Emphasizes fundamentals of technical writing. Reports. Lectures arranged. Livengood

FOR GRADUATES AND ADVANCED UNDERGRADUATES

TC 504 Fiber Formation-Theory and Practice. Preqs: MA 301, PY 208 or CI. 3(3-0) F. Practical and theoretical analysis of chemical and physical principles underlying the conventional methods of converting bulk polymer to useful fiber; rheology; melt, dry and wet polymer extrusion; fiber drawing; heat setting; application of general theory to unit processes. Cuculo

TC 505 Theory of Dyeing. Preq: CH 433 or CI. 3(3-0) S. Mechanisms of dyeing. Application of thermodynamics to dyeing systems. Kinetics of diffusion in dyeing processes. McGregor

TC 561 Organic Chemistry of High Polymers. Preqs: TC (CH) 461, CH 331 or 431. 3(3-0) S. Principles of step-and-chain-growth polymerizations; co-polymerization theory; homogeneous free radical polymerization; emulsion polymerization; Ziegler-Natta polymerizations; ionic polymerization. Gilbert, Theil

TC (CH) 562 Physical Chemistry of High Polymers-Bulk Properties. Preqs: CH 220 or 223; CH 331 or 431. 3(3-0) F. Molecular weight description; states of aggregation and their interconversion; rubbery, glassy and crystalline states; rubber elasticity; molecular friction; diffusion and viscosity; dynamics of network response; retardation- and relaxation-time spectra; thermo-dynamics of nucleation; kinetics of crystallization. Cates, Walsh

TC (CHE) 569 Polymers, Surfactants and Colloidal Materials. 3(3-0) F. (See chemical engineering, page 216.)

TC 591 Special Topics in Textile Science. Preqs: Sr. or grad. standing and CI. 1-4. Topics in textile science of interest to advanced students. Staff

FOR GRADUATES ONLY

TC 662 Physical Chemistry of High Polymers—Solution Properties. 3(3-0) S.

TC (CHE) 669 Diffusion in Polymers. 2(2-0) S.

TC (CHE) 671 Special Topics in Polymer Science. 1-3 F.

TC (TX) 691 Special Topics in Fiber Science. 1-3 S.

TC 698 Seminar for Textile Chemistry. 1 F,S.

TC 699 Textile Research for Textile Chemistry. Credits Arranged F,S,Sum.

Textile Technology

FOR UNDERGRADUATES

TX 211 Fiber Science II. Preq: MA 112 or 102. 3(2-2) F,S. The physical properties of textile raw materials as related to type of fibers and chemical structure. Typical areas are parameters used to describe textile fibers, classification in terms of quality factors, their reactions to moisture, stress-strain properties, method of measuring physical properties covered in Fiber Science I, and relationship between polymer structure, fiber properties, and their utilization as single fiber composites or blends of fibers. Staff

TX 320 Design and Control of Staple Yarn Systems. Preq: T 220. Coreq: TX 211. 5(4-2) F,S. The technological and economic aspects of staple yarn forming systems. Topics include fiber-machine interactions, use of automated systems and processes, blending of similar and dissimilar textile fibers, and control of the overall manufacturing operation to yield products with designed characteristics.
Bradford, Lynch, Pardue

TX 330 Textile Measurements and Quality Control. Preqs: T 250, ST 361. 4(3-2) F,S. Principles of measuring basic physical properties of textile materials, techniques of in-process control and evaluation of finished product quality, application to the manufacturing sequence of statistical control charts and capability limits, aspects of sampling theory . Hutchison, Stuckey

TX 340 Principles of Knitted Fabric Structures. Preqs: TX 211, T 250. 5(4-2) F,S. Warp and weft knit fabrics, their properties, end uses and production as related to current trends and developments in fabrics and machines. The principles of design and fabric geometry as a basis for performance, quality, and costing. Finishing and its effect on fabric properties. Middleton, Rhodes, Smith

TX 350 Woven Fabric Structures. Preqs: TX 211, T 250. 5(4-2) F,S. Performance characteristics of woven structures as related to properties of raw materials, fabric structure and methods of production. The utilization of modern control systems to optimize the systems involved in the production of woven fabrics.
Klibbe, Moser, Porter

TX 380 Management and Control of Textile Systems. Preqs: EC 201, T 250. 3(3-0) F,S. The principles and techniques of controlling the process of converting staple fibers or filament yarns into industrial and consumer products as viewed from the standpoint of the process decision maker. Cooper, Robinson

TX 405 Non-Conventional Fabric Structures. Preqs: Sr. standing and CI. 3(3-0) F,S. Advanced study of systems for direct conversion of fiber to fabrics. The total spectrum of possible fabric structure is surveyed and classified. Current marketable structures analyzed with respect to production technologic, economic, and property potential. Trends in direct conversion technology are discussed to pro-

vide a viable basis for participating in the evolution of the technology and its production George, Mohammed

TX 420 Modern Developments in Yarn Manufacturing Systems. Preq: Sr. standing. 3(3-0) S. The newly emerging means of yarn production such as open-end, compositor, self-twist and twistless forms of spinning. The preprocesses and their effects on spinning; also the after-processes and effects of the new systems. Lord

TX 425 Textured Yarn Production and Properties. Preqs: TX 211, T 220. 3(2-2) F,S. The structure of thermoplastic polymers in continuous filament form and their response to elevated temperatures, high velocity air flow and other methods of modification to produce bulked, textured and torque type yarns. Related properties such as stress relaxation, generation and control of electrostatic charges and responses to lower order tensile forces. El-Shiekh

TX 426 Long Staple and Tow Systems. Preqs: TX 211, T 220. 3(2-2) F,S. Long staple yarn forming systems including the woolen, worsted, tow to top, and compact yarn systems. Emphasis on relationship of fiber structures and characteristics necessary to produce the desired properties and performance characteristics of such yarns as woolen and worsted blends with man-made fibers, bulked yarns and carpet yarns. Pardue

TX 431 Special Topics in Testing. Preqs: TX 330, Sr. or grad. standing. 3(2-2) S. Special advanced techniques for measuring selected physical and aesthetic properties of natural and man-made textile materials; application of the physical law to technique and instrumentation; interrelation of the material, method of test, instrumentation involved and the resulting physical measure. Stuckey

TX 441 Knitwear and Hosiery Manufacture. Preq.: TX 340. 3(2-2) F,S. Complex weft knit mechanisms and their products. Hosiery, sweater strip, and full-fashioned equipment and products discussed with respect to quality, costing, and recent developments. Middleton

TX 449 Warp Knitting Systems. Preq: TX 340. 3(2-2) F,S. Critical review and discussion of production of warp knitted fabric principles. Aspects of warp knitting including yarns, machinery and methods of operation analyzed and discussed both individually and as a part of the total system. Fabric design, quality and costing. Staff

TX 450 Advanced Design and Weaving. Preq: TX 350. 3(2-2) F,S. Special weave formations and new developments and research findings in warp preparation, design weaving and fabric formation. Mohammed

TX 451 Complex Woven Structures. Preq: TX 450. 3(2-2) S. Design specifications for complex fabrics as related to fabric geometry, functional and aesthetic properties and manufacturing limitations. Mohammed

TX 460 Physical Properties of Textile Fibers. Preqs: MA 212, PY 212. 3(3-0) F,S. The structural, mechanical, thermal, optical, frictional and electrical properties, and the effect of moisture on physical and mechanical properties. Influence of these properties on utility and scope of fibers as related to performance. Fornes, Grady, Gupta, Hersh

TX 470 Fabric Styling and Design. Preqs: Jr. or sr. standing and CI. 2(2-0) F,S. Basic textile styling and design as influenced by aesthetic and end-use considerations. Limitations and influence of current technology on design principles and aesthetic capabilities. Massey

TX 480 Textile Cost Control. Preqs: TX 320, TX 350, EC 201. 3(3-0) F,S. Cost methods applicable to textile costing with emphasis on decision-making. Interpretation of cost reports and their use in pricing and cost control. Lynch, Powell

TX (EC) 482 Sales Management for Textiles. Preq: TX 380. 3(3-0) S. Definition and analysis of sales management in the textile industry. Areas of control and responsibility. Analytical tools of sales management with case methods. Staff

TX 484 Management Decision Making for the Textile Firm. Preq: TX (EC) 482. 3(3-0) S. The economic and environmental setting within which the textile firm makes decisions, and an application of various analytical tools, quantitative and qualitative, in making these decisions. Strategies for implementing decisions. Cooper, Robinson

TX 490 Development Project in Textile Technology. Preqs: Sr. standing, CI. 2-3 F,S. Introduction to research through experimental, theoretical and literature studies of textile and related problems. Staff

TX 491 Special Topics in Textiles. Preq: Sr. standing. 1-3 F,S. Current developments in the textile industry. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

TX 520 Yarn Processing Dynamics. Preq: MA 301 and CI. or grad. standing. 3(2-2) F. Theoretical analysis of the dynamics and machine-fiber interactions of such functions as opening, cleaning, carding actions, fiber attenuation, ring spinning, open-end spinning, texturing and winding. The role of fiber placement, cohesion and lubrication on yarn processing and properties. Laboratory experiments are designed to verify the analysis. El-Shiekh

TX 530 Textile Quality Control. Preq: TX 330 or CI. 3(3-0) S. Quality control systems for textile operations. Emphasis on sampling plans for attributes and variables and on interpretation of data as related to identifying sources of product variability. Stuckey

TX 550 Fabric Analytics. Preq: TX 350 or grad. standing. 3(3-0) F,S. Development of a numerical system for characterizing designs. Permutations and combinations of weave elements. Correlation of fiber and yarn properties with those of the fabrics. Engineering design of fabrics. Relationships between fabrics having geometrical similarity and the prediction of their physical properties. Bogdan

TX 555 Production Mechanics and Properties of Woven Fabrics. Preq: MA 301 and CI. or grad. standing. 3(2-2) S. The interrelations between the mechanics of production and mechanical properties of woven fabrics; unit operations required to prepare yarns for weaving and the mechanisms employed in weaving; fabric structure, geometry and mechanical properties; designing for specific fabric properties. Mohammed

TX 560 Structural and Physical Properties of Fibers. Preq: MA 301. 3(3-0) F. Advanced study (including thermal, optical, frictional and electrical) of textile fibers. Theoretical relations and advanced techniques. Gupta

TX 561 Mechanical and Rheological Properties of Fibrous Material. Preq: MA 301. 3(2-2) S. In-depth study of the stress-strain, bending torsional dynamic and rheological behavior of natural and man-made fibers. Theoretical relations and advanced techniques. Gupta

TX (EC) 585 Market Research in Textiles. Preqs: MA 405, ST 421. 3(3-0) S. The quantitative methods employed in market research in the textile industry. The

function of market research and its proper orientation to management and decision-making. Cooper

TX 586 Textile Labor Management. Preq: CI. 3(3-0) F,S,Sum. Labor management problems in the textile industry, with emphasis directed toward the roll of production supervision in a non-union textile plant. A study of NLRB decision and court opinions involving textile corporations. Powell

TX 590 Special Projects in Textiles. Preqs: Sr. standing or grad. standing, CI. 2-3 F,S. Special studies in the major or minor field of the advanced undergraduate or graduate student. Includes current problems of the industry, independent investigations, seminars and technical presentation, both oral and written Graduate Staff

TX 591 Special Topics. Preq: CI. 1-4 F,S. Intensive treatment of TX topics. Graduate Staff

TX 598 Textile Technology Seminar. Preqs: Sr. standing, CI. 2(2-0) S. Lecture, discussion of current textile industry topics. Graduate Staff

FOR GRADUATES ONLY

TX 601 Staple Fiber Structures I. 3(2-2) F.

TX 602 Staple Fiber Structures II. 3(2-2) F,S.

TX 621 Textile Testing III. 2(2-0) S.

TX 631 Synthetic Fibers. 2(1-2) F,S.

TX 641, 642 Advanced Knitting Systems and Mechanisms. 3(3-0) F,S.

TX 643, 644 Knitting Technology. 3(1-4) F,S.

TX 651, 652 Fabric Development and Construction. 3(1-4) F,S.

TX (MAE) 663 Mechanics of Twisted Structures. 3(3-0) F.

TX (MAE) 664 Mechanics of Fabric Structures. 3(3-0) S.

TX 680 Special Projects in Textile Management. 1-3 F,S,Sum.

TX 686 Advanced Textile Labor Management Seminar. 3(3-0) F,S.

TX (TC) 691 Special Topics in Fiber Science. 1-3 S.

TX 698 Seminar. 1(1-0) F,S.

TX 699 Textile Research. Credits Arranged.

Textiles

GENERAL COURSES

T 101 Fundamentals of Textiles. 2(1-2) F. Introduction to textiles: the history of the industry, description of textile materials and products and their utilization. Basic manufacturing systems, materials flow, terminology and calculations. Staff

T 200 Introduction to Textiles. Not open to students required to take T 101. 3(3-0) F,S. Survey of textiles including technical and economic history of the industry; physical and chemical processes involved in producing textile products from raw materials; unique aesthetic, physical and chemical properties of textiles and how these properties are determined by raw materials and production processes; and influence of properties of textile materials on their utilization and performance. Staff

T 203 Fiber Science I. Preq: CH 101. 3(3-0) F,S. Lectures emphasize: chemical constitution and properties of fiber-forming polymers; theories of fiber structure; relationship between the molecular structure of linear polymers and physical properties of natural and man-made fibers; principles and methods for producing man-made fibers; chemical behavior of natural and man-made fibers. Staff

T 220 Yarn Forming Systems. Preq: T 101 or equivalent. 4(3-2) F,S. The principles of staple and filament yarn systems and structures. The influence of the manufacturing system and the input materials on product characteristics. Staff

T 250 Fabric Forming Systems. Preq: T 101 or equivalent. 4(3-2) F,S. The basic systems, including nonconventional, weaving and knitting. Emphasis on fabric construction and geometry. Structures of fabric and resulting properties are related to raw materials and product performance. Staff

T 300 General Microscopy. Preq: PY 212. 3(1-4) F. The art and science of light microscopy and introduction to electron microscopy and microradiography; theoretical and practical aspects of visibility, resolution, and contrast. Laboratory practice in assembly, testing, and using various microscopes and accessories in describing, identifying, and photomicrographing crystalline, oriented, or amorphous materials used in the textile, fabric, plastic, and agricultural industries and in the life sciences. Staff

T 305 Introduction to Color Science. Preq: Soph. standing in Textiles or equivalent. 1(1-0) S. Discussion of color vision, defective color vision as it contributes to the understanding of color vision. Definition of color space and detailed discussion of the measurements and transformation of coordinates leading to the "CIE" color space. Color calculations, differences and matching. Goldfinger

T 492 Problems in Science and Technology. Preq: Jr. standing. 1(0-2) S. Lectures given by scientists and technologists from outside the University consisting of the description of a scientific or technological problem, its analysis and its solution. The latter is arrived at with class cooperation. Students write brief critical reviews of lectures; class discussions. Course may be taken twice for maximum of two credits. Staff

T 493 Industrial Internship in Textiles. Preq: Jr. or sr. in good standing. 3-6 Sum. A professional level work experience in any area of textiles designed to relate academic training in science and technology to industrial practice. Work experience under professional guidance. Written reports required and used as basis for grading. Registration must be approved in advance by the appropriate department head. Graded *S* or *U*.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

T 500 Advanced Microscopy. Preq: T 300 or CI. 3(1-4) S. The art and science of light and electron microscopy and introduction to microradiography; theoretical and practical aspects of visibility resolution and contrast. Laboratory practice in assembly, testing and using various microscopes and accessories in describing, identifying and micrographing crystalline, oriented or amorphous materials, especially those of student interest. Lab. may include special projects for independent investigations. Staff

T 501 Resinography. Preqs: T 300 or 500 and TX 460 or 560 or TC 461. 3(1-4) F,S. Lectures, laboratory and discussion regarding structure and morphology of resins, fibers, elastomers and composites which are studies by reflected light or electrons and by transmitted light or electrons. Other methods of diffraction and spectrometry. Crystallographic and optical properties. Staff

T 506 Color Science. Preq: TC sr. or grad. student. 3(2-2) F. Discussion of color theory with emphasis on color measurement. Color and color difference calculations. From data of the basic color matching experiments the description of a color-space and its transformation into the CIE color space will be followed. The basis of color difference calculations. Color matches and color differences calculated based on experimental data obtained in course. Goldfinger

Toxicology

TOX 510 Introduction to Biochemical Toxicology. Preq: Biochemistry, sr. status. 2(2-0) F.

TOX 515 Environmental Toxicology. Preq: Two years of biology. 2(2-0) S.

TOX 590 Special Problems in Toxicology. Preq: Grad. standing. 1-3.

FOR GRADUATES ONLY

TOX 690 Toxicology Seminar. 1(1-0) S.

University Studies

FOR UNDERGRADUATES

UNI (CHE) 300 Chemical Technology and the Environment. 3(3-0) F. (See chemical engineering, page 213.)

UNI 301 Science and Civilization. Preq: Soph. standing. 3(3-0) F,S. An inquiry into the scientific achievement and cultural impact of three different, but interrelated, models (or paradigms) of understanding the world and man's place in it: the Ancient-Medieval model of Aristotle, Ptolemy and Aquinas; the 17th century model of Newtonian physics; and the emerging, but fragmentary, 20th century model based upon the "new physics" of Einstein, Planck and Heisenberg.

UNI 302 Contemporary Science and Human Values. Preq: Soph. standing. 3(3-0) F,S. Surveys of some of the revolutionary developments in 20th Century science and scientific method, particularly in the bio-sciences and psycho-social sciences, and explores their major intellectual consequences.

UNI 303 Man and His Environment. Preq: Soph. standing. 3(3-0) F,S. Attention is directed to the fundamental concepts of ecology, the impacts of technology upon the contemporary world environment, the broad, humanistic aspects of our present environmental problems and the need for new institutional arrangements in both government and the university as an aid to their solution.

UNI 323 World Population and Food Prospects. Preq: Soph. standing. 3(3-0) S. An interdisciplinary analysis of United States and world population growth in connection with national and world food requirements and man's place in the ecology of the earth. Controversial proposals discussed and evaluated.

UNI 401 The Urban Crisis. 3(3-0) F. The change from a rural to an urban society, urban issues, the impact of technology and such resulting problems as poverty in affluence, racial tensions and changes in the environment. Controversial proposals discussed.

UNI 402 Peace and War in the Nuclear Age. 3(3-0) S. International issues facing the United States, particularly those which reflect the impact of the new technology. An examination of the revolution of modern weaponry, the cold war, and the consequences of the world arms race for the underdeveloped as well as the industrialized world. Controversial positions discussed.

UNI 490 Seminar in University Studies. 1-3 F,S. Investigation and discussion of selected topics of an interdisciplinary nature.

UNI 495 Special Topics in University Studies. 1-3, F,S. Examination of selected topics of an interdisciplinary nature.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

UNI 595 Special Topics in University Studies. Preq: Grad. standing or CI. 1-3 F,S. Examination of selected topics of an interdisciplinary nature.

Urban Design

UD 501 Introductory Problems in Urban Design. Preq: Grad. standing. 3(0-6) F. Descriptive analysis of physical and socio-economic phenomena of urban environments. Application of research methods in the definition and resolution of urban design problems. Batchelor

UD 502 Urban Design Workshop I. Preq: UD 501. 3(0-6) S. Complete synthesis of design factors influencing an environmental system or an urban complex. Batchelor

UD 510 Theory of Urban Form. Preq: Grad. standing or advanced undergrad. standing. 3(3-0) S. Survey of interdisciplinary theory of urban growth and evolution applied to historic and contemporary city form. Batchelor

UD 520 Theory and Principles of Urban Design. Preq: Grad. standing. 3(3-0) S. Examination of nature of design process in urban environments with emphasis on contemporary theory and practice. Staff

UD 530 Programming and Design Criteria for Community Development. Preq: Advanced undergrad. or grad. standing, or CI. 3(2-1) F,S. Designed to reveal the programmatic requirements of communities in terms of density, size, physical structure and evolutionary characteristics. Based on analysis of social and economic characteristics of urban populations. Provides the designer and planner with estimates of the projected demand for facilities and services. Batchelor

UD 590 Special Topics in Urban Design I. Preq: Fourth year standing. 1-6 F,S. Course provides flexible means for investigating areas of special interest in urban design. Graduate Staff

UD 595 Environmental Perception. Preq: Grad. standing. 3(3-0) S. Acquaints students with theories and research on the perception of urban environments. Emphasis on visual attributes as well as user perceptions of the environment, with focus on structuring of research to explore dimensions. Graduate Staff

FOR GRADUATES ONLY

UD 601 Urban Design Workshop II. 6(0-12) F.

UD 602 Advanced Problems in Urban Design. 6(0-12) S.

UD 690 Special Topics in Urban Design II. 1-6 F,S.

Veterinary Science

FOR ADVANCED UNDERGRADUATES

VET (PO) 401 Poultry Diseases. 4(3-3) S. The major infectious, noninfectious and parasitic diseases of poultry are studied with respect to economic importance, etiology, susceptibility, dissemination, symptoms and lesions. Emphasis upon practices for prevention, control and treatment of each disease. Colwell

FOR GRADUATES AND ADVANCED UNDERGRADUATES

VET (ANS) 505 Diseases of Farm Animals. Preqs: CH 101, 103. 3(3-0) F. The pathology of bacterial, viral, parasitic, nutritional thermal and mechanical disease processes. Batte

Wood and Paper Science

WPS (FOR) 101 Introduction to Forest Resources. 1(1-0) F. (See forestry, page 270.)

WPS 201 Elements of Wood. 3(2-3) S. For students not in Forest Resources. Identification, structure, properties and uses of common softwoods and hardwoods. Wood characteristics, moisture relationships and special features. Carter

WPS 202 Wood Structure and Properties I. Preqs: BS 100 or BO 200. 3(2-3) F. The macrostructure and microstructure of wood. Wood structure, the physical properties and uses of several commercially important coniferous and deciduous woods. Techniques of hand lens and microscope identification of wood. Thomas

WPS 203 Wood Structure and Properties II. Preqs: WPS 202, PY 221. 3(3-0) S. Physical properties of wood, specific gravity relationships, wood in relation to moisture, heat, sound, light, electricity, combustion, introduction to strength properties. Hart

WPS 205 Wood Products Practicum. Preqs: WPS 201 or 202. 5 Sum. Shop drawings and a bill of materials are prepared for a furniture item which is then constructed and finished. Processes include grading, drying, mechining, gluing, assembly and coating. All wood and wood-based materials used are prepared. Plant trips supplement the simulated factory order. Staff

WPS 210 Forest Products Internship. Preq: Completion of summer practicum. 1 Sum. Experience in the forest products or related industries. The student is assigned problem solving in an industrial situation to gain insight of forest products technology. Students write a paper on their experience. Carter

WPS 211 Pulp and Paper Internship. Preq: Completion of soph. year 1(1-0) F. Experience in the pulp and paper industry. The student is assigned problem solv-

ing in an industrial setting to gain insight of pulp and paper technology. Students write a paper on their experience. Staff

WPS (FOR) 219 Forest Economy and Its Operation. 3(2-2) F. (See forestry, page 271.)

WPS 220 Wood Protection. Preqs: WPS 202, CH 103. 3(2-3) S. Description of the deterioration of wood by various agents such as fungi, insects, fire, weather, and chemicals, and the methods of protecting wood against their action. Staff

WPS 242 Fiber Analysis. 3(1-4) S. Fiber microscopy; the determination of fiber measurement, quality, variation and identity in pulpwood. Staff

WPS (FOR) 273 Quantitative Methods in Forest Resources. 3(2-2) F,S. (See forestry, page 271.)

WPS 301 Wood Processing I. Preqs: WPS 201 or 202 and summer practicum. 3(2-2) F. The processes of drying, gluing and finishing wood. Processes of reconstituting wood as fiberboard, hardboard and particleboard. Basic requirements of various procedures and materials. Factors in selecting production methods. Carter

WPS 302 Wood Processing II. Preqs: WPS 201 or 203 and summer practicum. 3(2-3) S. The theories and techniques of converting raw wood into usable products by milling, veneering and chipping round wood. The processing of finished lumber, dimension stock, plywood and other wood products. Carter

WPS 315 Introduction to Wood-Polymer Principles. Preqs: WPS 203, CH 103. 2(2-0) F. Emphasis on basic organic and polymeric terminology necessary for understanding chemical components and macrostructure of wood. Introduction to the organic functional groups used in adhesives and finishes in wood products manufacturing. Kelly

WPS 316 Wood-Polymer Principles. Preq: WPS 315. 3(3-0) S. Emphasis on the chemical and physico-chemical properties of wood based on its polymeric chemical structure. Finishing and adhesive systems widely used in wood products manufacturing are described and characteristics detailed. Kelly

WPS 321, 322 Pulp and Paper Technology I, II. Preqs: CH 101, 107. 3(3-0) S. The physical and chemical characteristics of wood and cellulose. Chemistry and technology of the major mechanical, chemical and semichemical processes employed in the manufacture of pulp and paper. Hitchings

WPS 331 Introduction to Wood and Pulping Chemistry. Preq: CH 220. 1(1-0) F. Topics in organic chemistry required for a basic understanding of wood and pulping chemistry. Emphasis on carbonyl groups and aliphatic and phenolic hydroxyl groups as well as stereochemistry. Gratzl

WPS 332 Wood and Pulping Chemistry. Preqs: CH 220, WPS 331 or CH 221-223. 4(3-3) S. Wood as a basic source for fibers and chemicals. Major wood components including cellulose, hemicelluloses, lignin and extractives. Emphasis on the reactions of wood components in the major pulping and bleaching processes. Gratzl

WPS 344 Introduction to Quality Control. Preq: ST 361. 3(2-1) S. Methods used to control quality of manufactured wood products. Control charts of variables and attributes. Acceptance sampling techniques. Staff

WPS 403 Paper Process Anaylsis. Preqs: WPS 321, 322. 3(0-6) S. Manufacture of several types of papers with attention to stock preparation, sizing, filling and coloring. The finished products are tested physically and chemically and evaluated. Hitchings

WPS 411, 412 Pulp and Paper Unit Processes I and II. Preqs: CHE 301 and 302 3(3-0) F,S. The principles of the design, construction and operation of process and auxiliary equipment employed in the pulp and paper industry. Processes include pulping, recovery, pollution reduction, recycling, fiber sources other than wood, papermaking, power (steam and electric) generation and utilization. Rogers

WPS 413 Paper Properties and Additives. Preq: Sr. standing. 3(1-6) F. Physical, chemical, and microscopical testing of commercial papers; identification and evaluation of dyestuffs and color matching; nature and use of chemical additives in papermaking. Reeves

WPS (FOR) 423 Logging and Milling. Preq: Jr. standing. 3(2-3) F. Analysis of timber harvesting and transportation systems, equipment selection and costs; safety and supervision; manufacturing methods; log and lumber grades; analysis of investment alternatives. Mullin

WPS 434 Wood Operations. Preqs: WPS 301, 302. 3(2-3) F. Organization of manufacturing plants producing wood products, including company organization, plant layout, production planning and control. Analysis of typical manufacturing operations processes, equipment, size and product specification. The organization and operation of wood products markets. Carter

WPS (FOR) 435 Systems Analysis in Forest Products. Preq: Sr. standing. 3(3-0) S. Operations analysis techniques applied to management decision-making in wood products. Allocation of production resources, inventory of raw materials, scheduling of production activities and general problems of quantitative decision-making. Staff

WPS 441 Introduction to Wood Mechanics. Preqs: MA 212, PY 221 or 211. 2(2-0) F. Strength and related properties of commercial woods; standard ASTM strength tests; toughness; timber fastening; design of columns; simple, laminated and box beams; trusses and arches. Pearson

WPS 442 Wood Mechanics and Design. Preq: ESM 211 or WPS 441. 3(2-3) S. Wood as an engineering material. Topics include—generalized Hooke's law for orthotropic bodies and the effect of orientation of applied forces relative to the axes of symmetry; mechanical properties of wood as affected by its cellular structure; influence of defects, moisture, temperature and duration of load; visual and mechanical grading; derivation of working stresses; glued laminated construction; structural plywood; design of wooden members. Pearson

WPS 461 Paper Converting. Preq: Jr. standing. 1(1-0) S. The principal processes by which paper and paperboard are fabricated into products. Reeves

WPS 463 Plant Inspections. Preq: Sr. standing in Pulp and Paper. 1(0-3) S. One-week inspection trips of representative manufacturers of pulp and paper and papermaking equipment. Hitchings

WPS 471 Pulping Process Analysis. Preq: WPS 321. 3(1-6) F. Predominately a laboratory course concerned with preparation and evaluation of different types of wood pulp. The wood raw material is varied each year to study the principal pulp and bleaching variables and evaluate these critically. Students are organized in groups and encouraged to allocate time as necessary for experimental work. Hitchings

WPS 481 Pulping Processes and Products. Preq: WPS 202, CH 103. 2(2-0) S. Technology and economics of pulp products and by-products, including: paper and paperboard, containers and boxes, structural boards, molded and laminated products, cellulose fibers and films, cellulose derivatives and silvichemicals. Reeves

WPS 491 Senior Problems in Wood and Paper Science. Credits Arranged. Management or technology problems selected with faculty approval. Staff

FOR GRADUATES AND ADVANCED UNDERGRADUATES

WPS 513 Tropical Woods. Preqs: WPS 203, 301. 2(1-3) F. Structure, identification, properties, characteristics and use of tropical woods, especially those used in plywood and furniture. Staff

WPS 521, 522 Chemistry of Wood and Wood Products. Preqs: CH 315, CH 331, WPS 202, PY 212. 3(2-3) F,S. Fundamental chemistry and physics of wood and wood components; pulping principles; electrical and thermal properties. Staff

WPS 525 Pollution Abatement in Forest Products Industries. Preq: Grad. or advanced undergrad. standing in science or engineering curricula. 3(3-0) S. Pollution sources, inplant control and treatment of water and air pollution in forest products. Concentration on inplant pollution control in the pulp and paper industry. McKean

WPS 533 Advanced Wood Structure and Identification. Preq: WPS 202. 2(1-3) F. Advanced microscopic identification of the commercial woods of the United States and some tropical woods; microscopic anatomical features and laboratory techniques. Thomas

WPS 591 Wood and Paper Science Problems. Preq: Advanced undergrad. or grad. standing. Credits Arranged. Assigned or selected problems in silviculture, logging, lumber manufacturing, pulp technology, or forest management. Staff

WPS 599 Methods of Research in Wood and Paper Science. Preq: Advanced undergrad. or grad. standing. Credits Arranged. Research procedures, problem outlines, presentation of results; consideration of selected studies by forest research organizations; sample plot techniques. Staff

FOR GRADUATES ONLY

WPS 604 Timber Physics. 3(3-0) F,S.

WPS 605 Design and Control of Wood Processes. 3(0-3) F,S.

WPS 606 Wood Process Analysis. 3(3-0) F.

WPS 607 Advanced Quality Control. 3(3-0) S.

WPS 691 Graduate Seminar. 1(1-0) F,S.

WPS 693 Advanced Wood Technology Problems. Credits Arranged

WPS 699 Problems and Research. Credits Arranged

Zoology

FOR UNDERGRADUATES

ZO 201 Animal Life. Preq: BS 100 or 105. 4(3-3) F,S. The biology of the major groups of animals, emphasizing general structural plans and diversity, reproduction, development, ecology, behavior and evolution. Intended for non-zoology majors and majors in premedical, predental, and medical technology. Miller, Doerr

ZO 202 Invertebrate Zoology. Preq: BS 100. 4(3-3) F. The biology and classification of invertebrate animals especially types commonly encountered and those that illustrate zoological principles. Primarily for zoology and wildlife biology majors. Martof

ZO 203 Vertebrate Zoology. Preq: BS 100 or BO 200 4(3-3) F. The biology of the vertebrates: their adaptations and evolutionary history. Comparative physiological, developmental, behavioral and anatomical studies. Primarily for zoology and wildlife biology majors. Martof

ZO 212 Basic Anatomy and Physiology. Preq: BS 100 (only free elective credit allowed for students majoring in biological sciences, zoology, conservation and wildlife biology). 4(3-3) F. Major emphasis on the structure and function of the muscular, skeletal, circulatory and nervous systems. Grant

ZO 221 Conservation of Natural Resources. Preq: BS 100. 3(3-0) F,S. The importance of natural resources to man and the part they play in his environment. The physical, biological and ecological principles underlying natural resource conservation with attention to the biological consequences of overexploitation and environmental pollution. Barkalow

ZO 315 General Parasitology. Preq. ZO 201 or 202. 3(2-3) S. To gain a knowledge and appreciation of the life history, pathology and control of some common parasites. Miller

ZO 323 Comparative Anatomy. Preq: ZO 201, Jr. standing. 4(2-4) F,S. A comparative morphology of vertebrates demonstrating the interrelationships of the organ systems of the various groups. Harkema

ZO 345 Histology. Preq: ZO 323 or 203. 4(2-4) F. The microscopic anatomy of animal tissues. Harkema, Muse

ZO 353 Wildlife Management. Preq: BS 100. 3(3-0) F. Describes historical development from empirical practices to the scientific American system. The principles of management, protection, and conservation of those warm blooded vertebrates of aesthetic, sport or food values in urban, rural and wilderness areas. Barkalow

ZO (BO) 360 Introduction to Ecology. 4(3-3) F,S. (See botany, page 211.)

ZO 361 Vertebrate Embyrology. Preq: ZO 323 or 203. 4(3-3) S. Fundamental principles that apply to the embryonic development of vertebrates. Roberts

ZO 400 Biological Basis of Man's Environment. Preq: Jr. standing. 3(3-0) F,S. Man's impact on the environment and the biological laws that govern the consequences in terms of population growth, pollution, and ecology.

ZO (ENT) 401 Bibliographic Research in Biology. 1(1-0) F. (See entomology, page 267.)

ZO (BO) 414 Cell Biology. Preqs: CH 223, PY 212, ZO 201 or 203. 3(3-0) F. The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations. Roberts

ZO 415 Cellular and Animal Physiology Laboratory. Coreq: ZO 414 or ZO 421. 2(0-5) F,S. An introduction to physiological techniques and experimentation. Laboratory experiments include studies of cells and examination of the functions of vertebrate organ systems. Smith

ZO 420 Fishery Science. Preqs: ZO 201 or 203, ZO 360. 3(2-3) F. The science of fishery biology: life history and biology of important game and commercial fishes, fishing methods, age and growth analysis, survey of fishery resources, tagging studies, population estimations and pollution studies. Hassler, Huish

ZO 421 Vertebrate Physiology. Preqs: CH 223, PY 212, ZO 201 or 203. 3(3-0) F,S. Physiology of vertebrates with emphasis on mammals. A comprehensive study of the mechanisms that operate to sustain life. Smith

ZO 441 Ichthyology. Preq: ZO 203 or 323. 3(2-3) S. The classification and ecology of selected groups of fishes. Lectures, laboratories and field trips dealing with systematics, life histories, interrelationships and distribution. Hassler

ZO 490 Special Topics in Zoology. Preq: Jr. standing. 3(2-1)

FOR GRADUATES AND ADVANCED UNDERGRADUATES

ZO 501 Ornithology. Preqs: ZO 203 or 323, ZO 421. 3(2-3) F,S. The biology of birds: systematics, physiology, life histories, ecology and behavior. Quay

ZO (PSY) 503 Comparative Psychology. 3(3-0) S. (See psychology, page 354.)

ZO 510 Adaptive Behavior of Animals. Preq: ZO 421 or CI. 4(3-3) F. The comparative study of animal behavior including a treatment of physiological mechanisms and adaptive significance. Both invertebrates and vertebrates are studied. Whitsett

ZO (PHY) 513 Comparative Physiology. Preq: ZO 421 or CI. 4(3-3) S. Comparison of the organ systems of vertebrates and the physiological process involved in maintaining the hemostatic state. The various compensatory mechanisms employed during environmental stress. Staff

ZO 515 Growth and Reproduction of Fishes. Preqs or coreqs: GN 411, ZO 420, 421, 441. 3(2-3) S. The biology of fishes: physiology, anatomy, pathology, behavior and genetics. Primarily for graduate students in fisheries. Includes trips to research laboratories. (Offered in S 1975 and alt. years.) Pardue

ZO 517 Population Ecology. Preqs: ZO 360 and ST 511 or equivalent. 3(3-0) S. The dynamics of natural populations. Current work, theories and problems dealing with population growth, fluctuation, limitation and patterns of dispersion, the ecological niche, food chains and energy flow. Emphasis on methods of study. Hayne

ZO 519 Limnology. Preq: ZO 360 or equivalent. 4(3-3) F. A study of inland waters. Lectures deal with physical, chemical and biological factors that affect freshwater organisms. General principles illustrated in laboratory and on field trips. Hobbie

ZO (PO) 524 Comparative Endocrinology. 4(3-3) S. (See poultry science, page 350.)

ZO (MAS) 529 Biological Oceanography. Preq: ZO 360 or CI. 3(3-0) S. Stresses the dynamic interrelationships between organisms of the sea and their physical and chemical environment. Examines fundamental concepts in biological oceanography stressing experimental methods. Staff

ZO (GN) 532 Biological Effects of Radiations. 3(3-0) S. (See genetics, page 274.)

ZO (GN) 540 Evolution. 3(3-0) F. (See genetics, page 274.)

ZO 542 Herpetology. Preqs: ZO 203 or ZO 323, ZO 421. 3(2-3) S. The biology of the amphibians and reptiles: systematics, life history, anatomy, behavior, physiology and ecology. Martof

ZO 544 Mammalogy. Preqs: ZO 203 or 323, CI. 3(2-3) S. The classification, identification and ecology of the major groups of mammals. Barkalow

ZO (GN) 550 Experimental Evolution. 3(3-0) F. (See genetics, page 274.)

ZO 553 Principles of Wildlife Sciences. Preq: ZO 360. 3(2-3) F. The principles of wildlife management and their application are studied in the laboratory and in the field. Davis

ZO (MB) 555 Protozoology. Preq: CI. 4(2-6) F. The biology of the Protozoa: lectures include morphology, physiology, ecology, genetics, reproduction, evolution, systematics and life-cycles of both free-living and parasitic taxa; laboratory stresses recognition of selected forms and demonstrates techniques to prepare specimens for microscopic examination. Bradbury

ZO (BO) 560 Principles of Ecology. Preq: Three semesters of college-level biology courses. 4(3-3) F. Each of the major subject areas of ecology is developed in sufficient depth to provide a factual and philosophical framework for understanding ecology. Staff

ZO (PHY, ENT) 575 Physiology of Invertebrates. Preq: ZO 202 or CI. 3(3-0) F. Physiology of invertebrates including the insects but excluding the Protozoa. The unity of the physiology of the various groups stressed. Wolcott

ZO 581 Helminthology. Preqs: ZO 323 or 203, ZO 315 or equivalent. 4(2-4) F. The study of the morphology, biology and control of the parasitic helminths. Miller

ZO (ENT) 582 Medical and Veterinary Entomology. 3(2-3) S. (See entomology, page 268.)

ZO 590 Special Studies. Preqs: Twelve hours zoology, CI. Credits Arranged. A directed individual investigation of a particular problem in zoology, accompanied by a review of the pertinent literature. Staff

ZO 592 Topical Problems. Preq: CI. 1-3. Organized, formal lectures and discussions of a special topic. Staff

FOR GRADUATES ONLY

ZO 603 Advanced Parasitology. 3(2-3) S.

ZO 610 Current Aspects of Animal Behavior. 4(3-3) S.

ZO 614 Advanced Cell Biology. 3(3-0) F.

ZO 619 Advanced Limnology. 3(1-6) S.

ZO 621 Fishery Science. 3(2-3) F.

ZO (BO) 660 Advanced Topics in Ecology I. 4(3-3) S.

ZO (BO) 661 Advanced Topics in Ecology II. 4(3-3) S.

ZO 690 Seminar. 1(1-0) F,S.

ZO 699 Research in Zoology. Credits Arranged.

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UNIVERSITY DISRUPTIONS POLICY AND PROCEDURES

POLICIES, PROCEDURES, AND DISCIPLINARY ACTIONS IN CASES OF DISRUPTION OF THE EDUCATIONAL PROCESS

The following statements concerning policies, procedures, and disciplinary actions in cases of disruption of the educational process were approved by the Trustees of the University of North Carolina and as such they remain in effect until modified by action by the Board of Governors of the new University system or by the Trustees of North Carolina State University.

Section 1. Policies Relating to Disruptive Conduct

The University of North Carolina has long honored the right of free discussion and expression, peaceful picketing and demonstrations, the right to petition and peaceably to assemble. That these rights are a part of the fabric of this institution is not questioned. They must remain secure. It is equally clear, however, that in a community of learning willful disruption of the educational process, destruction of property, and interference with the rights of other members of the community cannot be tolerated. Accordingly, it shall be the policy of the University to deal with any such disruption, destruction or interference promptly and effectively, but also fairly and impartially without regard to race, religion, sex or political beliefs.

Section 2. Definition of Disruptive Conduct

(a) Any faculty member (the term "faculty member", wherever used in this policy shall include regular faculty members, full-time instructors, lecturers, and all other persons exempt from the North Carolina State Personnel System [Chapter 126 of the General Statutes as amended] who receive compensation for teaching, or other instructional functions, or research at the University), any graduate student engaged in the instructional program, or any student who, with the intent to obstruct or disrupt any normal operation or function of the University or any of its component institutions, engages, or incites others to engage, in individual or collective conduct which destroys or significantly damages any University property, or which impairs or threatens impairment of the physical well-being of any member of the University community, or which, because of its violent, forceful, threatening or intimidating nature or because it restrains freedom of lawful movement, otherwise prevents any member of the University community from conducting his normal activities within the University, shall be subject to prompt and appropriate disciplinary action, which may include suspension, expulsion, discharge or dismissal from the University.

The following, while not intended to be exclusive, illustrate the offenses encompassed herein, when done for the purpose of obstructing or disrupting any normal operation or function of the University or any of its component institutions: (1) occupation of any University building or part thereof with intent to deprive others of its normal use; (2) blocking the entrance or exit of any University building or corridor or room therein with intent to deprive others of lawful access to or from, or use of, said building or corridor or room; (3) setting fire to or by any other means destroying or substantially damaging any University building or property, or the property of others on University premises; (4) any possession or display of, or attempt or threat to use, for any unlawful purpose, any weapon, dangerous instrument, explosive, or inflammable material in any University building or on any University campus; (5) prevention of, or attempt to prevent by physical act, the attending, convening, continuation or orderly conduct of any University class or activity or of any lawful meeting or assembly in any University building or on any

University campus; and (6) blocking normal pedestrian or vehicular traffic on or into any University campus.

(b) Any person engaged in the instructional program who fails or refuses to carry out validly assigned duties, with the intent to obstruct or disrupt any normal operation or function of the University or any of its component institutions, shall be subject to prompt and appropriate disciplinary action under this policy if (but only if) his status is such that he is not subject to the provisions of Section 603 of Chapter VI of the Code of the University of North Carolina.

Section 3. Responsibilities of Chancellors

(a) When any Chancellor has cause to believe than any of the provisions of this policy have been violated, he shall forthwith investigate or cause to be investigated the occurrence, and upon identification of the parties involved shall promptly determine whether any charge is to be made with respect thereto.

(b) If he decides that a charge is to be made, he shall, within thirty (30) days after he has information as to the identity of the alleged perpetrator of the offense but in no event more than twelve (12) months after the occurrence of the alleged offense, (i) refer the case to the appropriate existing University judicial body, [See Faculty Hearing Committee in Chapter VIII below] or (ii) refer the matter to a Hearing Committee drawn from a previously selected Hearings Panel [See Hearings Panel in Chapter VIII below] which, under this option, is required to implement action for violation of Section 2 (a) or (b) of this Chapter. If the case is referred to an existing University judicial body under (i) above, the procedural rules of that body shall be followed, and subsections (c) through (f) below shall not be applicable. If the matter is referred to a Hearing Committee under (ii) above, the procedural rules prescribed in subsections (c) through (f) below shall be followed.

(c) The accused shall be given written notice by personal service or registered mail, return receipt requested, stating:

(1) The specific violations of this policy with which the accused is charged.

(2) The designated time and place of the hearing on the charge by the Hearing Committee, which time shall be not earlier than seven (7) nor later than ten (10) days following receipt of the notice.

(3) That the accused shall be entitled to the presumption of innocence until found guilty, the right to retain counsel, the right to present the testimony of witnesses and other evidence, the right to cross-examine all witnesses against him, the right to examine all documents and demonstrative evidence adverse to him, and the right to a transcript of the proceedings of the hearing.

(d) The Hearing Committee shall determine the guilt or innocence of the accused. If the person charged is found guilty, the Hearing Committee shall recommend to the Chancellor such discipline as said body determines to be appropriate. After considering such recommendation the Chancellor shall prescribe such discipline as he deems proper. In any event, whether the person is found guilty or not guilty, a written report shall be made by the Chancellor to the President within ten (10) days.

(e) Any person found guilty shall have ten (10) days after notice of such finding in which to appeal to the President of the University. Such an appeal if taken shall be upon the grounds set forth in Section 5.

(f) Any accused person who, without good cause, shall fail to appear at the time and place fixed for the hearing of his case by the Hearing Committee shall be suspended indefinitely or discharged from University employment.

(g) A Chancellor, unless so ordered or otherwise prevented by court, shall not be precluded from carrying out his duties under this policy by reason of any pending action in any State or Federal court. Should a delay occur in prosecuting the charge against the accused because the accused or witnesses that may be necessary to a determination of the charge are involved in State or Federal court actions, the time limitations set forth above in this Section 5-3 shall not apply.

(h) Conviction in any State or Federal court shall not preclude the University or

any of its officers from exercising disciplinary action in any offense referred to in this policy.

(i) Nothing contained in this policy shall preclude the President or any Chancellor from taking any other steps, including injunctive relief or other legal action, which he may deem advisable to protect the best interests of the University.

Section 4. Aggravated Acts or Threatened Repetition of Acts

(a) The Chancellor of each of the component institutions of the University shall appoint an Emergency Consultative Panel which shall be composed of not less than three (3) nor more than five (5) faculty members and not less than three (3) nor more than five (5) students who shall be available to advise with the Chancellor in any emergency. No member of such Panel shall serve for more than one (1) year unless he be reappointed by the Chancellor. The Chancellor may make appointments, either temporary or for a full year, to fill any vacancies which may exist on the Panel.

(b) If, in the judgment of the Chancellor, there is clear and convincing evidence that a person has committed any of the acts prohibited under this policy which, because of the aggravated character or probable repetition of such act or acts, necessitates immediate action to protect the University from substantial interference with any of its orderly operations or functions, or to prevent threats to or acts which endanger life or property, the Chancellor, with the concurrence as hereinafter provided of the Emergency Consultative Panel established pursuant to (a) above, may forthwith suspend such person from the University and bar him from the University campus; provided, however, that in the event of such suspension the person suspended shall be given written notice of the reason for his suspension, either personally or by registered mail addressed to his last known address, and shall be afforded a prompt hearing, which, if requested, shall be commenced within ten (10) days of the suspension. Except for purposes of attending personally any hearings conducted under this policy, the bar against the appearance of the accused on the University campus shall remain in effect until final judgment has been rendered in his case and all appellant proceedings have been concluded, unless such restriction is earlier lifted by written notice from the Chancellor.

(c) A quorum of the Emergency Consultative Panel provided for in (a) above shall consist of not less than four (4) of its members, and the required concurrence shall have been obtained if a majority of such quorum shall indicate their concurrence. The Chancellor shall meet personally with members of such Panel at the time he seeks concurrence, if it is feasible to do so. However, if the circumstances are such that the Chancellor deems it not to be feasible to personally assemble such members, then he may communicate with them or the required number of them individually by telephone or by such other means as he may choose to employ, in which event he may proceed as provided in (b) above after the required majority of such members have communicated their concurrence to him.

(d) In the Chancellor's absence or inability to act, the President may exercise the powers of the Chancellor specified in this Section 4 in the same manner and to the same extent as could the Chancellor but for such absence or inability to act.

Section 5. Right of Appeal

Any person found guilty of violating the provisions of this policy by the Hearing Committee referred to in Section 3 shall have the right to appeal the finding and the discipline imposed upon him to the President of the University. Any such appeal shall be in writing, shall be based solely upon the record, and shall be limited to one or more of the following grounds:

(1) That the finding is not supported by substantial evidence;
(2) That a fair hearing was not accorded the accused; or
(3) That the discipline imposed was excessive or inappropriate.

It shall be the responsibility of the President to make prompt disposition of all such appeals, and his decision shall be rendered within thrity (30) days after receipt of the complete record on appeal.

Section 6. No Amnesty

No administrative official, faculty member, or student of the University shall have authority to grant amnesty or to make any promise as to prosecution or non-prosecution in any court, State or Federal, or before any student, faculty, administrative, or Trustee committee to any person charged with or suspected of violating Section 5-2 (a) or (b) of these Bylaws.

Section 7. Publication

The provisions of this policy shall be given wide dissemination in such manner as the President or Chancellors may deem advisable, and shall be printed in the official catalogues which may be issued by each component institution of the University.

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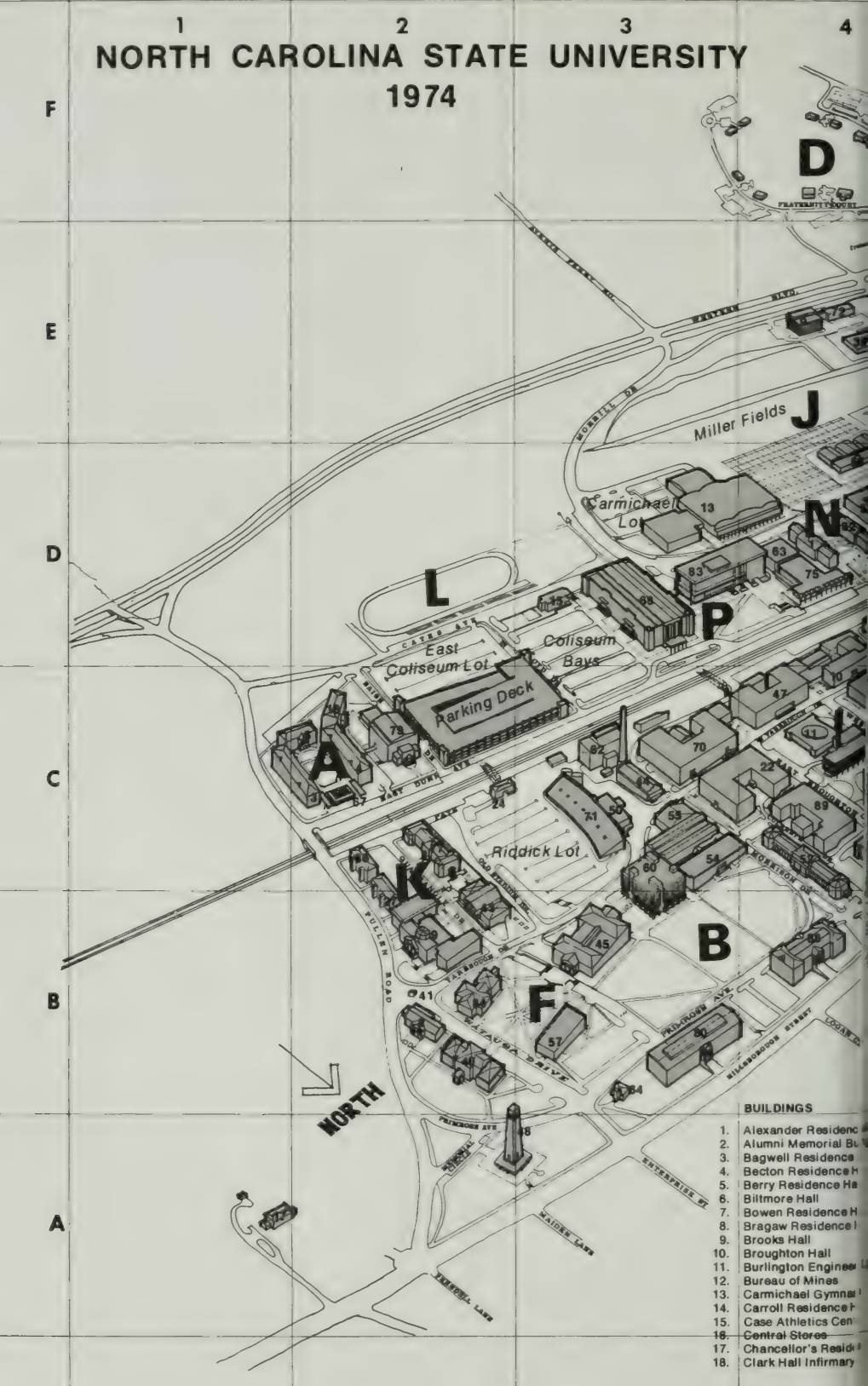
NORTH CAROLINA STATE UNIVERSITY
1974



	BUILDINGS	GRID	IBM CODE
19.	Clark Laboratories	5-D	CL
20.	Cox Hall	4-D	COX
21	Dabney Hall	4-D	DAB
22.	Daniels Hall	4-C	DAN
23.	Farm Unit 5	6-F	
24.	Field House	2-C	FH
D.	Fraternity Court	4-F	
25.	Gardner Hall	5-D	GA
26.	Gardner Hall Addition	5-D	
27.	Gold Residence Hall	2-C	
28.	Greenhouse—Agronomy	5-D	AGH
29.	Greenhouse—Biological Sciences	5-D	BSG
30.	Greenhouse—Horticulture	5-D	HGH
31.	Greenhouse—840 Method Rd.	8-F	
32.	Greenhouse—Plant Pathology	5-D	PPG
33.	Grinnells Animal Health Lab	5-E	GHL
34.	Harrelson Hall	5-D	HA
35.	Harris Cafeteria	5-D	
36.	D. H. Hill Library-original wing	5-C	DHL
37.	D. H. Hill Library-book stack tower	5-C	
38.	D. H. Hill Library-Erdahl-Cloyd wing	5-C	
39.	Hodges Wood Products Lab	4-E	HWP
40.	Holladay Hall	2-B	
41.	Information Center	2-B	
42.	Kilgore Hall	6-D	KI
43.	King Religious Center	2-B	KRC
44.	Laundry	3-C	
45.	Leazar Hall	3-B	LEZ
46.	Lee Residence Hall	5-E	
47.	Mann Hall	4-C	MN
H.	McKimmon Village (17 apt. bldgs. A-Q)	7-F	
48.	Memorial Tower	3-A	
49.	Metcalf Residence Hall	4-D	
50.	Morris Building	3-C	
51.	Nelson Textile Building	6-D	N
52.	1911 Building	4-C	
53.	Owen Residence Hall	4-D	
54.	Page Hall	3-C	PA
55.	Park Shops	3-C	PS
56.	Patterson Hall	4-C	PT
57.	Peele Hall	3-B	
58.	Physical Plant Shops	4-D	
59.	Phytotron	5-D	PHY
60.	Poe Hall	3-C	POE
61.	Polk Hall	4-C	PK
62.	Power Plant	3-C	
63.	Price Music Center	4-D	PMC
64.	Primrose Hall	3-B	
65.	Former Print Shop	5-D	
66.	New Print Shop	6-E	
67.	Quad Snack Bar	2-C	
68.	Wm. Neal Reynolds Coliseum	3-D	
69.	Ricks Hall	4-C	RI
70.	Riddick Engineering Labs	3-C	RD
71.	Riddick Stadium	3-C	
72.	Robertson Wing, Biltmore Hall	4-E	
73.	Schaub Food Science Building	4-E	SFS
74.	Scott Hall	5-D	SC
75.	Students Supply Store	4-D	
76.	Sullivan Residence Hall	6-E	
77.	Syme Residence Hall	2-C	
78.	Television Center	6-F	TVS
79.	Frank Thompson Theater	2-C	TT
80.	Tompkins Hall	3-B	T
81.	Tucker Residence Hall	4-D	
82.	Turlington Residence Hall	4-D	
83.	University Student Center	3-D	USC
84.	Watauga Hall	2-B	
85.	Weaver Laboratories	5-E	DSW
86.	Welch Residence Hall	2-C	
87.	Williams Hall	5-D	WMS
88.	Winston Hall	4-B	WN
89.	Withers Hall	4-C	WI
90.	Turner House	6-C	

	COURTS AND FIELDS	GRID
A.	Becton-Berry Quad	2-C
B.	Court of North Carolina	3-B
C.	Doak Field	6-E
D.	Fraternity Court	4-F
E.	Gardner Arboretum	4-C
F.	Holladay Hall Court	3-B
G.	Lee-Bragaw Court	5-E
H.	McKimmon Village	7-F
J.	Miller Fields	4-E
K.	Syme-Brooks Court	2-C
L.	Track	2-D
M.	Tucker-Owen Court	4-D
N.	Turlington-Alexander Court	4-D
O.	University Plaza	5-C
P.	University Student Center Plaza	3-D

	PARKING LOTS	GRID
	Brooks Avenue Lot	6-C
	Carmichael Lot	3-D
	Coliseum Bays	3-D
	East Coliseum Lot	2-C
	Harris Lot	4-E
	Parking Deck	2-C
	Riddick Lot	3-C
	West Lot	6-E
	Sullivan Lot	6-E
	Sullivan Temporary Lot	7-E

Department of Admissions
P. O. Box 5126
Raleigh, North Carolina 27607

Raleigh, North Carolina 27611

North Carolina State University Bulletin
SUMMER SESSIONS 1975

NORTH CAROLINA STATE UNIVERSITY BULLETIN

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SUMMER SESSIONS 1975

North Carolina State University
Raleigh, North Carolina

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NORTH CAROLINA STATE UNIVERSITY

ADMINISTRATION

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R. James Peeler Jr., *Acting Vice Provost and Dean of the Graduate School*
Earl G. Droessler, *Vice Provost and Dean for Research*
William L. Turner, *Vice Chancellor for Extension and Public Service*
Jackson A. Rigney, *Dean for International Programs*
Banks C. Talley Jr., *Vice Chancellor for Student Affairs*
John D. Wright, *Vice Chancellor for Finance and Business*
Rudolph Pate, *Vice Chancellor for Foundations and Development*

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Claude E. McKinney, *School of Design*
Carl J. Dolce, *School of Education*
Ralph E. Fadum, *School of Engineering*
Eric L. Ellwood, *School of Forest Resources*
Robert O. Tilman, *School of Liberal Arts*
Arthur C. Menius Jr., *School of Physical and Mathematical Sciences*
David W. Chaney, *School of Textiles*

SUMMER SESSIONS

William L. Turner, *Vice Chancellor for Extension and Public Service*
Charles F. Kolb, *Director*

ADMISSIONS

Anna P. Keller, *Director*

REGISTRATION

James H. Bundy, *University Registrar*

SUMMER SESSIONS CALENDAR 1975

FIRST SESSION

May 7	Wednesday	Last day to preregister for first session.
May 20	Tuesday	New student orientation; registration 8:30 a.m. to 12 noon; preregistration will automatically be cancelled for those who do not complete registration by 12 noon; late registration fee for those who complete registration after 12 noon, May 20.
May 21	Wednesday	First day of classes.
May 26	Monday	Last day to register; last day to withdraw (or drop a course) with refund.
June 6	Friday	Last day to drop a course or withdraw without a grade.
June 24	Tuesday	Last day of classes.
June 25	Wednesday	Final examinations.

SECOND SESSION

June 18	Wednesday	Last day to preregister for second session.
June 30	Monday	New student orientation; registration 8:30 a.m. to 12 noon; preregistration will automatically be cancelled for those who do not complete registration by 12 noon; late registration fee for those who complete registration after 12 noon, July 1.
July 1	Tuesday	First day of classes.
July 4	Friday	Holiday.
July 7	Monday	Last day to register; last day to withdraw (or drop a course) with refund.
July 18	Friday	Last day to drop a course or withdraw without a grade.
August 5	Tuesday	Last day of classes.
August 6	Wednesday	Final examinations.

The University Plaza with Harrelson Hall, N. C. State's round classroom building, and the D. H. Hill Library which includes an 11-story book tower, is convenient to residence halls and research facilities.

NORTH CAROLINA STATE UNIVERSITY

North Carolina State University is a large and complex state university, one of the major state universities of the nation.

It shares the distinctive character of Land-Grant state universities nationally—broad academic offerings, extensive public involvement, national and international activities, and large-scale extension and research programs.

State was founded as a Land-Grant state university under terms of the famed federal Morrill Act of 1862 which provided for public land endowments to support a college in each state.

The Land-Grant heritage of fulfilling three major functions—research, extension and academic affairs—is reflected in the large dimensions of these functions at North Carolina State University.

The rich and varied academic program of the University is comprised of some 90 bachelors of arts and science programs, 68 master's degree fields and 45 doctoral degrees.

Its research activities span a broad spectrum of about 700 scientific, technologic and scholarly endeavors, with a budget of over $20 million annually.

Extension programs of the University are similarly diverse and include urban affairs, marine sciences, environmental protection, engineering industrial and textiles extension, agricultural extension and many others.

The annual University's budget is about $80 million. The University has 4,600-plus employees. There are 1,621 faculty and professional staff and 174 adjunct and federal agency faculty, including 974 graduate faculty.

There are 120 campus buildings with an estimated value of about $150,000,000.

The central campus is 596 acres, though the University has 88,000 acres, including one research and endowment forest of 78,000 acres. Research farms; biology and ecology sites; genetics, horticulture, and floriculture nurseries; and Carter Stadium areas near the main campus comprise about 2,500 acres.

Principal operational locations for the University in North Carolina are the Marine Sciences Center at Wilmington, the Fisheries Laboratory at Hatteras, the Minerals Research Laboratory at Asheville, and Pamlico Marine Laboratory at Aurora, and the 20 agricultural research stations and forests.

North Carolina State University is one of the three Research Triangle Universities along with Duke University and the University of North Carolina at Chapel Hill. In the 30-mile triangle formed by the three Universities is the 5,000-acre Research Triangle Park, the Research Triangle Institute, a Universities' subsidiary, and the Triangle Universities Computation Center, a central facility for the extensive computing centers of the institutions.

In the fall of 1974, the University's total enrollment was 15,751. There are 12,801 undergraduates, 2,635 graduate students and about 315 other students. Students at State come from all 50 states and some 60 other countries. The international enrollment is a distinctive feature of the institution and its international students give it a decidedly cosmopolitan aura.

North Carolina State University is organized in eight schools and the Graduate School. The eight schools are Agriculture and Life Sciences, Design, Education, Engineering, Forest Resources, Liberal Arts, Physical and Mathematical Sciences and Textiles. In addition, a complex of divisions and programs provide for a wide range of special programs in academic affairs, research and extension.

State is one of 118 recognized members of the National Association of State Universities and Land-Grant Colleges. It is also a member of the American Council on Education, the College Entrance Examination Board, the Council of Graduate Schools in the United States, the National Commission on Accrediting, and the Southern Association of Colleges and Schools.

The University is accredited by national and regional accrediting agencies applicable to the University and its numerous professional fields.

In addition to the 15,751 regularly-enrolled students, 15,556 persons enrolled in 1974 in State's credit and non-credit continuing education courses. The 1974 Summer Sessions drew 8,187 students. Other enrollments included 11,854 in some 200 short courses, 1,241 in cultural and professional enrichment courses, 1,261 in off-campus credit courses and 1,200 in correspondence courses.

In the fall of 1974, 71.0 percent of the entering freshmen were in the top one-quarter of their high school graduating classes. A total of 95.9 percent were in the top half of their classes. About 82 percent of all applicants are accepted. The average combined SAT score for the entering freshmen in 1974 was 1026.

THE SUMMER SESSIONS

The Summer Sessions at North Carolina State University offer an extensive educational program planned to meet the varied needs and interests of over 8,000 students. Fifty departments offer instruction in more than 600 courses, over one-third of which are at the graduate level.

Each of State's eight schools, with a combined faculty of more than 300, participates in the summer study program: six schools offer courses during two regular five-week sessions, the School of Design offers one nine-week program, the School of Forest Resources conducts a summer camp for sophomores and two five-week practicums, and the School of Agriculture and Life Sciences offers a three-week program for extension workers and other adult educators. In addition, special programs and institutes are offered during the summer by the University.

Summer courses and special programs are designed for the new student, the undergraduate wanting to advance his or her academic standing at State, the graduate desiring to continue study and research during the summer months and for visiting students pursuing degrees at other institutions. Teachers who need to earn credit toward renewal of teaching certificates or advanced degrees in education and persons in professional fields who wish to keep abreast of new developments and trends also take advantage of State's summer programs. In addition, the Summer Sessions offer high school students planning to enroll at North Carolina State University the opportunity of taking required sub-college work in mathematics.

The School of Textiles' physical resources allow demonstrations of machines and equipment used in processing natural and man-made fibers.

ADMISSIONS

All students regardless of race or sex are equally welcome at North Carolina State University. Anyone may apply for and accept admission confident that the policy and practices of the University will be administered without discrimination.

Students are admitted to the summer sessions in one of seven categories: 1) new freshmen, 2) new undergraduate transfer students, 3) new graduate students, 4) special students, 5) continuing North Carolina State University students, 6) former North Carolina State University students, 7) suspended North Carolina State University students.

NEW FRESHMEN

Application forms for new freshmen should be obtained from the Director of Admissions, Peele Hall, P. O. Box 5126, NCSU, Raleigh, North Carolina 27607. The summer school application form in this catalog should not be completed.

A freshman applicant should be a graduate of an accredited secondary school. Non-graduates should have a high school equivalency certificate. The following high school preparation, or its equivalent, is necessary: English, 4 units; history or social studies, 2 units; mathematics, 2 units in algebra, 1 unit in geometry, and 1 unit in advanced math is strongly recommended for some programs; science, 2 units, preferably biology, chemistry, or physics; foreign language, 2 units for the School of Liberal Arts only.

Freshman applicants must take the Scholastic Aptitude Test of the College Entrance Examination Board and have their scores submitted to the Office of Admissions by the Board. These scores, together with the high school record, will be considered in determining admissibility. Information as to the time and place at which the Scholastic Aptitude Test will be given may be obtained from high school guidance counselors, or by writing directly to the College Entrance Examination Board, Box 592, Princeton, New Jersey 08540 for the *Bulletin of Information*. *The Bulletin* includes an application form and is available without charge.

Although the Achievement Test scores are not used in the admissions decision, the English and Math Level I Tests are recommended for proper placement. Other Achievement Tests are recommended also, depending upon the college curriculum the applicant intends to enter. Additional information concerning these tests is included in the Freshman University Bulletin and the Notice of Admissions.

NEW TRANSFER STUDENTS

In addition to submitting an application form which may be obtained from the Director of Admissions, Peele Hall, all transfer students must have official transcripts sent to the Admissions Office directly from each institution attended. The summer school application in this catalog should *not* be completed.

Transfer applicants must have an overall grade average of "C" (2.0) or better on *all* college-level academic work attempted and be eligible to return to the last college or university regularly attended. For admission as an upperclass transfer student, the applicant must present a minimum of 28 semester hours of work with grades of "C" or better from accredited institutions. If

credit has not been received on a college-level mathematics course, the secondary school record must be submitted. Those applicants with less than 28 semester hours of transferable credit must also meet the admissions requirements for entering freshmen. Out-of-state students should be prepared to meet slightly higher standards.

NEW GRADUATE STUDENTS

All students working towards advanced degrees are enrolled in the Graduate School. An admission application may be obtained from the Dean of the Graduate School, Peele Hall, P. O. Box 5335, NCSU, Raleigh, North Carolina 27607.

STUDENTS ADMITTED TO THE FALL SEMESTER

Any student cleared for regular admission for the fall semester wishing to attend either summer session should notify the Admissions Office, Peele Hall, to change the date of entrance. He or she should *not* fill out a summer sessions application.

SPECIAL STUDENTS

Special students must complete the Summer Sessions registration application in the front of this catalog. A special student is one who has not been formally admitted as a degree candidate at North Carolina State University. All students visiting from other schools will be classified as special students. Special students are limited to a class load of not more than seven semester hours. In unusual cases, a special student visiting from another college may be allowed to take more than seven hours if permission is obtained from the Director of Summer Sessions.

Special or visiting students wishing to take graduate level courses (500-600) will be classified as Post-Baccalaureate Students (PBS) and registered automatically for credit only. Performance of credit only students is graded only as satisfactory (*S*) or unsatisfactory (*U*).

Students classified as PBS who wish to change to a regular letter grade status (*A, B, C, NC*) may do so by having a graduate adviser sign an approval form not later than May 26, the last day to register for first summer session, or July 7 for second summer session. Approval forms may be obtained at the Summer Sessions Office, Room 134, 1911 Building and when signed must be turned in to Registration and Records, Room 4, Peele Hall.

Students classified as PBS are limited to a total of nine semester hours of letter grade credit.

NOTE: Public school teachers who have never been enrolled as regular students at North Carolina State University and who are renewing an "A" certificate may register as special students if they desire; those renewing a graduate certificate should register in the Post Baccalaureate Studies Program. The Division of Professional Services requires a graduate classification for the renewal of a graduate certificate. Students desiring regular graduate status must apply for admission through the Graduate School.

CONTINUING NCSU STUDENTS

Any regular NCSU degree candidate student may attend summer school. The summer school application in this catalog should *not* be completed, but registration procedures as listed on page 12 should be followed.

READMISSION OF FORMER NCSU STUDENTS

Former North Carolina State University students who wish to attend the Summer Sessions must apply for readmission through Registration and Records at least 30 days prior to the intended date of return. The readmission application may be obtained by writing to Registration and Records, Peele Hall, P. O. Box 5126, NCSU, Raleigh, N. C. 27607. The summer school application in this catalog should not be completed.

SUSPENDED NCSU STUDENTS

Students suspended at the end of the spring semester, 1975, may attend one or both sessions of summer school to become eligible to continue in the fall. The summer school application in this catalog should *not* be completed, but registration procedures as listed on page 12 should be followed. Students suspended prior to the spring semester, 1975, may attend one or both sessions of summer school but should follow readmissions procedures. The readmission application may be obtained by writing Registration and Records, Peele Hall, P. O. Box 5126, NCSU, Raleigh, N. C. 27607.

Architectural design students may take advantage of a nine-weeks course during the Summer Sessions.

REGISTRATION

PREREGISTRATION FOR NCSU DEGREE STUDENTS

All NCSU degree students who plan to attend summer school must preregister. Preregistration consists of selecting the courses to be taken during the first and/or second session and filing a Preregistration Schedule Request Form with Registration and Records. On registration day, each student obtains a completed class schedule. (Graduate students who preregister will be allowed to complete registration by mail.)

Currently enrolled degree students will preregister for the summer session at the time they preregister for the 1975 fall semester.

Former degree students returning may preregister for the summer session after they have filed an application for readmission and have received their letter of approval.

New freshmen and new transfer degree students who desire to attend the summer session should contact the Admissions Office.

The preregistration period for all NCSU degree students will be from Tuesday, April 1, 1975, through Friday, April 11, 1975. The last day to preregister for the first summer session will be Wednesday, May 7, 1975, and for the second session, Wednesday, June 18, 1975.

PREREGISTRATION FOR NON-DEGREE STUDENTS

Special (non-degree) students will preregister for the summer session by completing the Summer Sessions registration application in the front of the Summer Sessions Catalog and filing this with the Summer Sessions Office by mail or in person. Preregistration requests for the first summer session will be accepted through Wednesday, May 7, 1975, and for second session through Wednesday, June 18, 1975.

REGISTRATION

All students will complete registration on May 20, 1975 (first session) and/or June 30, 1975 (second session) at Reynolds Coliseum. Registration on both days will be from 8:30 a.m. to 12 noon. There will be a $10 late registration fee for all students who fail to register by 12 noon on the respective registration day. *Preregistration will automatically be cancelled for those who do not complete registration by 12 noon on the respective registration day.*

WITHDRAWAL FROM THE UNIVERSITY

If a regularly enrolled degree student wishes to withdraw from the University during the summer session (dropping all course work for which one has registered), he or she must initiate the official withdrawal process at the Counseling Center. Special students (non-degree) who wish to withdraw should contact the Division of Continuing Education.

Determination of grades and the entry on the permanent record for a student withdrawing during a summer session depend upon one's reasons for withdrawal, the time of withdrawal in the summer session, and one's standing in the courses at the time of withdrawal. A student who discontinues attendance in all classes without officially withdrawing will receive all "NC" grades. A student who withdraws after the fourth day of classes in a summer session will

Several summer courses combine lecture-recitation periods with laboratory work which develops skills and allows the application of knowledge.

receive no refund of tuition and fees, except in unusual cases approved by the refund committee. The committee is empowered to approve a petition for unexpected military orders, when a physician advises withdrawal due to extensive illness, or when circumstances justify waiving the rules. These petitions are available in the office of the Dean of the Division of Student Affairs.

SPECIAL NOTES

1. Tuition and fees are payable by check or cash on the day of registration. Students must have the necessary funds with them. Advanced billing of tuition and fees will be made *only* for those students who preregister.
2. Students planning to take courses in both sessions should plan their sequences well in advance. Offerings in the second session are often substantially less in number than in the first session, and in many instances, departments do not offer courses in both summer sessions.
3. Everything possible will be done to insure that the courses listed in the catalog will be given at the time indicated. *The Director of Summer Sessions reserves the right, however, to withdraw courses in which enrollment is deemed insufficient.*
4. The normal load for either session of summer school is six or seven hours for undergraduates and six hours for graduates. Any student may carry less. Regularly enrolled students who desire to carry more than seven hours must obtain the approval of the dean or director of instruction of the school in which they are enrolled. Such approval in writing must be presented to the Director of Summer Sessions. Students visiting from other schools who wish to take more than seven hours must obtain the approval of the Director of Summer Sessions.

ACADEMIC REGULATIONS

North Carolina State University's new grading system for measuring academic achievement, which became effective the fall semester, 1974, is:

LETTER GRADES

Grades	*Definition*	*Quality Points Per Credit Hour*
A	Excellent	4
B	Good	3
C	Satisfactory	2
NC	No Credit	0
S	Satisfactory (Grade for Credit-only course)	
U	Unsatisfactory (No credit grade for Credit-only course)	
IN	Incomplete	
LA	Temporarily Late	
AU	Audit	
NR	No Recognition Given for Audit	

QUALITY POINT AVERAGE

The number of credit hours officially attempted in a semester or summer session (for which a report of *A*, *B*, *C*, *NC* is received) is divided into the total number of quality points earned to arrive at the Quality Point Average (QPA).

A pollination technique used for pine trees is demonstrated.

A = 4 quality points per credit hour
B = 3 quality points per credit hour
C = 2 quality points per credit hour
NC = 0 quality points per credit hour

The Quality Point Average of work attempted will be computed to three decimal points and used solely for class ranking and academic recognition. Questions concerning this grading system should be directed to James H. Bundy, University Registrar, P.O. Box 5126, NCSU, Raleigh, N.C. 27607.

UNIVERSITY JUDICIAL SYSTEM

All students are subject to and are responsible for familiarizing themselves with the Student Body Statutes. Copies of the Student Body Statutes are available in the Student Development Office, 204 Peele Hall or the Student Attorney General's office, 4130 University Student Center.

EXPENSES

The following expenses apply for each of the summer sessions.

TUITION AND FEES—SUMMER SCHOOL 1975

RESIDENTS OF NORTH CAROLINA				NONRESIDENTS			
Hours	*Tuition & Academic Fee*	*Required Fees*	*Total*	*Hours*	*Tuition & Academic Fee*	*Required Fees*	*Total*
1	$ 18.50	$ 28.00	$ 46.50	1	$ 57.50	$ 28.00	$ 85.50
2	30.00	28.00	58.00	2	108.00	28.00	136.00
3	41.50	28.00	69.50	3	158.50	28.00	186.50
4	53.00	28.00	81.00	4	209.00	28.00	237.00
5	64.50	28.00	92.50	5	259.50	28.00	287.50
6	76.00	28.00	104.00	6	310.00	28.00	338.00
7	97.50	28.00	115.50	7	360.50	28.00	388.50
8	99.00	28.00	127.00	8	411.00	28.00	439.00
9	110.50	28.00	138.50	9	461.50	28.00	489.50
10	122.00	28.00	150.00	10	512.00	28.00	540.00

REQUIRED FEES
(must be paid by all students)

Medical	$ 6.00
Student Center	16.50
Physical Education	5.50
	$ 28.00

Summer Research (GR 596S or GR 696S)	
In-Residence ($28.50 plus $28.00 fees)	$ 56.50
*Not-In-Residence	28.50
Thesis Preparation Only (GR 598 or GR 698)	
In-Residence ($28.50 plus $28.00 fees)	56.50
*Not-In-Residence	28.50
Dissertation Research (GR 697)	
In-Residence ($28.50 plus $28.00 fees)	56.50
*Not-In-Residence	28.50
Examination Only (GR 597)	
In-Residence ($18.50 plus $28.00 fees)	46.50
*Not-In-Residence	18.50
Audit Only	Rates same as for credit
Full-Time Faculty and Staff	7.00

RESIDENCE STATUS

North Carolina's General Assembly in its 1973 session amended the law applying to determination of a student's residence status for tuition purposes (G.S. 116-143.1) to read: "To qualify for in-state tuition a legal resident must have maintained his domicile in North Carolina for at least the 12 months immediately prior to his classification as a resident for tuition purposes. In order to be eligible for such classification, the individual must establish that his or her presence in the State during such 12-month period was for purposes of maintaining a bona fide domicile rather than for purposes of mere temporary residence incident to enrollment in an institution of higher education; further, (1) if the parents (or court-appointed legal guardian) of an individual seeking resident classification are (is) bona fide domiciliaries of this State, this fact shall be prima facie evidence of domiciliary status of the individual applicant and (2) if such parents or guardian are not bona fide domiciliaries of this State, this fact shall be prima facie evidence of non-domiciliary status of the individual."

University regulations concerning the classification of students by residence, for purposes of applicable tuition differentials, are set forth in detail in *A Manual To Assist The Public Higher Education Institutions of North Carolina in the Matter of Student Residence Classification for Tuition Purposes.* Each enrolled student is responsible for knowing the contents of the Manual, which is the controlling administrative statement of policy on this subject. Copies of the Manual are available on request at the Admissions Office, 112 Peele Hall.

REFUND OF TUITION AND FEES

A student who withdraws from school on or before the fourth day of classes of either summer session will receive a refund of the full amount paid less a registration fee. After the period specified, no refunds will be made.

In some instances circumstances justify waiving rules regarding refunds. An example might be withdrawal from the University because of illness. Students have the privilege of appeal to the refund committee when they feel special

* A statement from the employer, department head, or major adviser indicating the student will not be residing in the Raleigh area during the semester must be submitted to the Office of Business Affairs to qualify for the reduced rate.

consideration is merited. Application for such appeals may be secured from the Division of Student Affairs.

FINANCIAL AID

The financial aid available to regular students attending summer school is ordinarily limited to loans and jobs. Students who must have financial aid should make application to the Financial Aid Office, 205 Peele Hall, as far in advance as possible, preferably by April 1.

The University has no financial aid for summer visitor students. However, these students may have access to the part-time job listings in the Financial Aid Office.

COUNSELING

The Counseling Center in Peele Hall has a staff of full-time counselors to help students with the problems of adjustment to college life, problems of vocational and curricular choice and other problems a student might wish to discuss with a professionally trained counselor. The Center administers vocational tests and maintains a file of occupational information to help guide students in career selection.

Referral can be made for students needing special kinds of help.

Students may come to the Center on their own accord, or they may be referred by teachers, advisers or other members of the University staff. There normally is no charge for conferences, although a small materials fee is charged when tests are administered and nominal fees are charged for group counseling and continuing marriage counseling.

These biological sciences students are running a behavioral experiment with Siamese fighting fish.

HOUSING

RESIDENCE HALLS

During the 1975 summer sessions, housing will be provided for men and women. To be eligible to live in a residence hall, a student must be enrolled for one or more courses. Participants in short courses, conferences, and workshops of less than one month's duration will be located in separate facilities. These persons should write to the director of their program for specific housing information and application pertaining to their particular group.

Assignment to a room for the summer session does not guarantee that a room will be available for the fall semester. A student must be accepted by NCSU for fall enrollment in order to be eligible to apply for University housing.

A selected student staff under the supervision of professionally trained personnel will be available to advise and assist residents. They also are responsible for overseeing the operation of the building and its condition.

The rooms are furnished with desks, dressers, beds, and closets and the building is equipped with lounges, laundry rooms and vending areas.

MARRIED STUDENT HOUSING

The University operates 300 apartments (McKimmon Village) for married students. Information on availability and application should be requested from the Department of Residence Life, NCSU, Box 5072, Raleigh, North Carolina 27607.

FRATERNITY HOUSES

Several of the 17 fraternity houses located on or adjacent to the campus provide housing for summer school students. Twelve of the 17 houses are fully air-conditioned and all provide furnished rooms and living areas. In addition, several houses offer board plans during the summer months. Any student interested in further details should write to the Office of Student Development, 204 Peele Hall, NCSU, Raleigh, N. C. 27607 or telephone 737-2442.

ROOM RENTALS AND APPLICATIONS

The rental rate for a five-week session is $60 per person in a double room. If space is available, a single room may be reserved for $90 each session. To obtain an assignment, the student completes the room application card (new students will be mailed a card) and returns it with a check to the Office of Business Affairs, NCSU, Box 5067, Raleigh, N. C. 27607. The room assignment will be mailed if time permits, or may be picked up at the Department of Residence Life in Leazar Hall on the day the residence halls open for the session.

Residents will be permitted to change rooms after the first week of classes with the approval of the Department of Residence Life. The room change fee is $5. Opening days of the residence halls:

First Session — 12 noon, Monday, May 19, 1975
Second Session — 12 noon, Sunday, June 29, 1975

HOUSING REFUND POLICY

A room application must be cancelled in writing addressed to the Department of Residence Life, NCSU, Box 5072, Raleigh, N. C. 27607.

If the room application is cancelled BEFORE the opening day of the residence halls, the rental fee paid will be refunded less a $10 processing fee.

If the room application is cancelled AFTER the halls officially open, a refund will be given only if the space is reassigned to a NEW resident. The refund will be the rental fee paid less $10 processing fee and a prorated daily charge from the opening day of the halls until the space is reassigned. If there are more vacant spaces than there are room applications waiting for assignment, NO REFUND of room rent will be made until ALL spaces are filled.

If a student fails to check-in and secure his or her keys by the first day of classes, the room application will be subject to cancellation and NO REFUNDS will be made except as stated above.

D. H. HILL LIBRARY

The D. H. Hill Library of North Carolina State University houses a collection of more than 700,000 volumes of books and bound journals. The collection has been developed to reflect the scientific and technological interests of the University, but the arts and social sciences are also well represented. The library subscribes to more than 6,500 current periodicals and receives all publications of the various experiment stations. The library has been a depository for U.S. Government publications since 1924 and has been designated as one of the depositories for all unclassified publications of the Atomic Energy Commission, the National Aeronautics and Space Agency, and the Food and

Some horticulture students grow their own plants for laboratory exercises.

Agricultural Organization of the United Nations. Publications from many foreign countries are received on exchange—especially those publications dealing with the sciences and engineering.

Three special interest collections form on-campus branches of the main library. The Textiles Library, housed in Nelson Hall, contains holdings in textiles and textile chemistry. The School of Design Library, in Brooks Hall, has a collection of books, journals and slides in the fields of architecture, landscape architecture and product design. A Forest Resources Library and reading room is available in Biltmore Hall.

There are several reading rooms in the air-conditioned library building. Carrels, conference and seminar rooms are available for students and faculty. The library maintains a photocopy service, and equipment for reading microfilms and microcards is available.

The scholar, student and browser will each discover the materials and services of the library to be useful and enjoyable additions to his summer sessions program. The bookstack and all areas of the library complex are open to all students and faculty.

Library hours for the Summer Sessions are as follows:

Monday-Friday	8 a.m.-11 p.m.
Saturday	9 a.m.- 6 p.m.
Sunday	1 p.m.-10 p.m.

SUMMER ACTIVITIES

Through many curricular and extracurricular activities, the Summer Sessions provide special opportunities to those students engaged in summer study. Interesting, informative and entertaining programs and activities are scheduled for each session.

A few of the more popular activities and special features include the Carmichael Gym athletic and recreation programs and the varied activities sponsored by the University Student Center.

The University's regular program of student personnel services is available to summer students. It includes the Counseling Center for educational, career and personal counseling; the Career Planning and Placement Center for career planning and placement; the Residence Life and Residence Facilities offices for residence quarters; the Financial Aid office for financial assistance; and the Student Health Service for medical care.

Several of State's buildings are air-conditioned for summer comfort. Among these are the Student Supply Store, where students will find books and equipment for recreational as well as academic pursuits; Harrelson Hall, State's unusual round classroom building where more than half of the Summer Sessions classes are held; and the University Student Center, conveniently located near many of the residence halls.

Beyond the campus, the city of Raleigh offers cultural and recreational opportunities of interest to students. The Raleigh Little Theater presents several productions during the summer, the North Carolina Museum of Art sponsors gallery concerts and exhibits, and there are several swimming pools and city and state parks located in and around Raleigh.

Politics students consider strategic, economic, military and psychological factors affecting foreign policy.

UNIVERSITY STUDENT CENTER

The hub of campus summer activity is the University Student Center. The Center is supported in part by student fees, and all regularly enrolled students are invited to attend the programs and activities sponsored by the Summer Programs Board.

These programs include movies and a variety of social and recreational events.

The air-conditioned Center offers many facilities, including a television lounge, an art gallery, offices for student organizations, a billards room, a cloak room, a snack bar, a dining room, a theater and meeting rooms.

A Center annex in the Erdahl-Cloyd Wing of the D. H. Hill Library offers a barbershop, a snack bar and a games room.

Building hours during the summer are:

University Student Center	
Monday-Saturday	7 a.m.-11 p.m.
Sunday	9 a.m.-11 p.m.
University Student Center Annex Snack Bar and Games Area:	
Monday-Friday	7 a.m.- 3 p.m.
Saturday and Sunday	Closed
Vending open 24 hours a day	

SPECIAL COURSES AND INSTITUTES

Department of Adult and Community College Education

SPECIAL THREE-WEEK SUMMER SESSION FOR ADULT AND COMMUNITY COLLEGE EDUCATORS

June 9-27

The Department of Adult and Community College Education offers a special three-week summer program of instruction designed to provide graduate education and professional improvement opportunities for extension workers, community college and technical institute personnel, public school adult educators, adult basic education personnel, vocational education teachers and others in public or private adult education services. The program provides adult educators with the opportunity to increase their understanding of adults, contemporary society, administration of educational programs, leadership, social action, group processes, communication and planning.

The program is interdisciplinary; it utilizes the professional competence of a permanent and visiting faculty. Courses are in areas of adult and community college education, behavioral and social sciences and technical agriculture. The student is encouraged to synthesize concepts from these areas and apply them to his or her professional responsibilities.

Eleven offerings are scheduled. Each participant may take only one course. Currently enrolled degree students at North Carolina State University must preregister through the normal preregistration procedures. All other students will register the first day of classes. To assist the Department of Adult and Community College Education in planning, students who do not preregister are requested to complete and return the information form by May 16. The form may be obtained from Dr. W. L. Gragg, Department of Adult and Community College Education, 310 Poe Hall.

The following courses will be offered:

ED 537 (001)	The Extension and Public Service Function in Higher Education (Community Services Function in Adult and Community College Education)
ED 596 (002)	Topical Problems in Adult and Community College Education (Evaluation and Accountability in Informal Adult Education)
ED 596 (003)	Topical Problems in Adult and Community College Education (Innovations in Community College Education)
ED 596 (004)	Topical Problems in Adult and Community College Education (The Modern Practice of Adult Education)
ED 596 (005)	Topical Problems in Adult and Community College Education (Management and Supervision of Adult Education)
ED 596 (006)	Topical Problems in Adult and Community College Education (Non-Traditional Study in Adult and Higher Education)
ED 598	Teaching Disadvantaged Adults
ANS 403	Swine Management
CS 514	Principles and Methods in Weed Science
EC 401	Economic Analysis for Non-Majors
HEC 522	Parent Education

Summer Institute in English for Foreign Students

July 7-August 15

The Summer Institute in English for Foreign Students at North Carolina State University is designed for those students from other countries who intend to pursue university studies or specialized training programs in the United States in the fall. It is designed to furnish them with intensive instruction and practice in the use of the English language. Emphasis is placed on developing fluency in speaking and understanding spoken English as well as reading and writing skills. The institute also offers orientation to American life and institutions to give the students insight into life in the U.S. and help them to adjust to the new environment. There are field trips on weekends to various industries and places of historic, cultural and scenic interest.

Any student who has a score of 450 on the TOEFL Test (Test of English as a Foreign Language) or an equivalent facility in the use of spoken English may attend the institute. (Information about taking the test at one of the centers located in the students' home countries may be obtained by writing to: Test of English as a Foreign Language, Educational Testing Service, Princeton, New Jersey.)

Admission to the institute does not imply admission to the regular session at North Carolina State University or any other campus of the University of North Carolina.

The institute, which is sponsored by the Division of Continuing Education in cooperation with the Summer Sessions and the Department of Foreign Languages and Literatures, is under the direction of Miss Virginia Prichard of the Department of Foreign Languages and Literature. All classroom work is conducted in Harrelson Hall on the campus. Classes, including language laboratory practice sessions, are held five and a half hours a day, Monday through Friday, from 0900 to 1230 and from 1400 to 1600. (Attendance at the institute does not carry academic credit, although students who complete the program receive a certificate of attendance.)

The total cost of the six-week program is approximately $600.00. The cost of the institute is estimated on the basis of campus dormitory accommodations and meals at the campus cafeterias. Incidental expenses, such as laundry, dry cleaning, entertainment, etc., are not included. (Room rent includes sheets and towels.)

Tuition, Books and Fees	$275.00
Room in Campus Dormitory	$108.00
Food (Estimated)	$200.00
Insurance and Infirmary Fee	$ 21.00

Financial assistance is available to those students who qualify. The Department of State has made available to the institute a number of tuition grants under the auspices of the Institute of International Education. To be eligible for one of these grants, a student must arrive in the U.S. just prior to the institute, must be accepted at an American institution of higher learning for study in the fall, and must be financing his own studies without other scholarship aid.

For further information about the institute or financial assistance, write to John Cudd, Program Coordinator, Division of Continuing Education, 134 1911 Building, NCSU, Raleigh, North Carolina, 27607.

COURSE LISTINGS

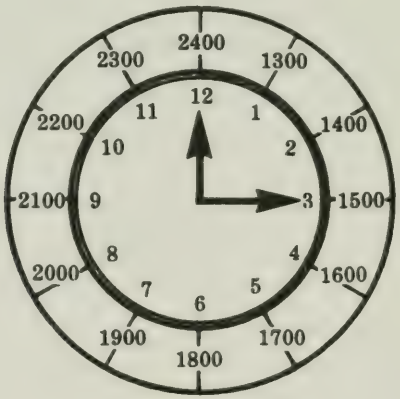
Courses are listed by department, departmental abbreviation and numerical designator. Semester hour credits for each course are given following the name of the course. Classes meet daily, Monday through Friday, except where specified to the contrary. The symbols "LR" and "LB" before the clock hours refer to lecture-recitation and laboratory hours, respectively. If there is no symbol before the clock hours, lecture-recitation is implied. The symbol "CN" refers to the call number for each course. This number must be indicated on the preregistration schedule request form by students who are preregistering for summer sessions courses.

Courses numbered from one through 100 are preparatory courses carrying no college credit; courses in the 100, 200, 300 and 400 series are primarily designed for undergraduates; courses in the 500 series for graduates and advanced undergraduates; and courses in the 600 series for graduates only.

All courses are subject to cancellation by the Director of Summer Sessions if there is inadequate enrollment.

Waiver of prerequisites is at the discretion of the instructor.

Please note that class meeting times in this catalog are indicated in international time which is measured in hours numbered to 24 instead of 12.



If the schedule shows the class beginning at:	The beginning hour in terms of a 12-hour clock is:	If the schedule shows the class beginning at:	The beginning hour in terms of a 12-hour clock is:
0800	8:00 a.m.	1600	4:00 p.m.
0900	9:00 a.m.	1700	5:00 p.m.
1000	10:00 a.m.	1800	6:00 p.m.
1100	11:00 a.m.	1900	7:00 p.m.
1200	12:00 noon	2000	8:00 p.m.
1300	1:00 p.m.	2100	9:00 p.m.
1400	2:00 p.m.	2200	10:00 p.m.
1500	3:00 p.m.		

Special Graduate Categories

FIRST SESSION AND SECOND SESSION

GR 596S MR Summer Research	(CN. 46-596-001)	0
GR 597 Masters Exam	(CN. 46-597-001)	0
GR 598 MR Thesis Preparation	(CN. 46-598-001)	0
GR 696S DR Summer Research	(CN. 46-696-001)	0
GR 697 Dissertation Research	(CN. 46-697-001)	0
GR 698 DR Thesis Preparation	(CN. 46-698-001)	0

Accounting

(Also see Economics and Business.)

FIRST SESSION

ACC 260 Accounting I—Concepts of Financial Reporting 3
0800-0930 (CN. 04-260-001) Hilliard
0800-0930 (CN. 04-260-002) Staff
0950-1120 (CN. 04-260-003) Hilliard

ACC 262 Managerial Uses of Cost Data 3
Prerequisite: ACC 260
0950-1120 (CN. 04-262-001) McBurney

SECOND SESSION

ACC 260 Accounting I—Concepts of Financial Reporting 3
0950-1120 (CN. 04-260-001) Jeffreys
1140-1310 (CN. 04-260-002) Jeffreys

ACC 261 Accounting II—Financial Information Systems 3
Prerequisite: ACC 260
0800-0930 (CN. 04-261-001) Windham
0950-1120 (CN. 04-261-002) Windham

Animal Science

FIRST SESSION

ANS 403 Swine Management 3(2-3)
Prerequisite: ANS 204
Special three-week session (June 9-June 27)
0900-1200 (CN. 10-403-001)

Currently enrolled degeee students at North Carolina State University must preregister through the normal preregistration procedures. All other students will register the first day of classes. To assist the Department of Adult and Community College Education in planning, students who do not preregister are requested to complete and return an information form by Friday, May 16. The form may be obtained from Dr. W. L. Gragg, Department of Adult and Community College Education, 310 Poe Hall.

ANS 590 Topical Problems in Animal Science Maximum 6
Hours arranged (CN. 10-590-001)

ANS 699 Research in Animal Science Credits Arranged
Hours arranged (CN. 10-699-001)

SECOND SESSION

ANS 590 Topical Problems in Animal Science — Maximum 6
Hours arranged (CN. 10-590-001)

ANS 699 Research in Animal Science — Credits Arranged
Hours arranged (CN. 10-699-001)

Anthropology

FIRST SESSION

ANT 252 Cultural Anthropology — 3
0800-0930 (CN. 12-252-001) — Nickerson
0950-1120 (CN. 12-252-002) — Nickerson

SECOND SESSION

ANT 252 Cultural Anthropology — 3
0800-0930 (CN. 12-252-001) — Wallace

ANT 305 Peoples of the World — 3
0950-1120 (CN. 12-305-001) — Wallace

Biochemistry

FIRST SESSION

BCH 490 Special Studies in Biochemistry — 1-3
Prerequisite: Senior standing
Hours arranged (CN. 15-490-001) — Staff

***BCH 554 Radioisotope Techniques in Biology** — 2
Prerequisite: BCH 351 or permission of instructor
0810-1200 (CN. 15-554-001) — Sisler
*Three week course

BCH 590 Special Topics in Biochemistry — Maximum 3
Prerequisite: BCH 351 or equivalent
Hours arranged (CN. 15-590-001) — Graduate Staff

BCH 695 Special Topics in Biochemistry — Credits Arranged
Prerequisite: Graduate standing in biochemistry
Hours arranged (CN. 15-695-001) — Graduate Staff

BCH 699 Biochemical Research — Credits Arranged
Hours arranged (CN. 15-699-001) — Graduate Staff

SECOND SESSION

BCH 351 Elementary Biochemistry — 3
Prerequisite: CH 223
0950-1120 (CN. 15-351-001) — Main

BCH 490 Special Studies in Biochemistry — 1-3
Prerequisite: Senior standing
Hours arranged (CN. 15-490-001) — Staff

BCH 590 Special Topics in Biochemistry — Maximum 3
Prerequisite: BCH 351 or equivalent
Hours arranged (CN. 15-590-001) — Graduate Staff

BCH 695 Special Topics in Biochemistry — Credits Arranged
Prerequisite: Graduate standing in biochemistry
Hours arranged (CN. 15-695-001) — Graduate Staff

BCH 699 Biochemical Research Credits Arranged
Hours arranged (CN. 15-699-001) Graduate Staff

Biological and Agricultural Engineering

FIRST SESSION

BAE 590 Special Problems Credits Arranged
Prerequisite: Senior or graduate standing in agricultural engineering
Hours arranged (CN. 16-590-001) Staff

BAE 690 Special Topics Credits, Arranged, 1-4
Prerequisite: Graduate standing
Hours arranged (CN. 16-690-001) Staff

BAE 699 Research in Biological and Agricultural Engineering
Credits Arranged, 1-4
Prerequisite: Graduate standing in biological and agricultural engineering
Hours arranged (CN. 16-699-001) Graduate Staff

SECOND SESSION

BAE 590 Special Problems Credits Arranged
Prerequisite: Senior or graduate standing in agricultural engineering
Hours arranged (CN. 16-590-001) Staff

BAE 690 Special Topics Credits Arranged, 1-4
Prerequisite: Graduate standing
Hours arranged (CN. 16-690-001) Staff

BAE 699 Research in Biological and Agricultural Engineering
Credits Arranged, 1-4
Prerequisite: Graduate standing in biological and agricultural engineering
Hours arranged (CN. 16-699-001) Graduate Staff

Biological Sciences

FIRST SESSION

BS 100 General Biology 4
LR 0800-0930 (CN. 17-100-001)
LB 1020-1300 T Th (CN. 17-100-101)
LB 1340-1620 T Th (CN. 17-100-102)
LB 1020-1300 W F (CN. 17-100-103)
LB 1340-1620 W F (CN. 17-100-104) Staff

BS 495 Special Topics in Biology Credits Arranged, 1-6
Hours arranged (CN. 17-495-001) Staff

SECOND SESSION

BS (ENT) 410 Biology of Insects 3
(See entomology, page 46.)

BS 495 Special Topics in Biology Credits Arranged, 1-6
Hours arranged (CN. 17-495-001) Staff

Biomathematics

FIRST SESSION

BMA 493 Special Topics in Biomathematics 1-3
Prerequisite: Consent of instructor
Hours arranged (CN. 18-493-001) Staff

BMA 591 Special Topics Maximum 3
Prerequisite: Consent of instructor
Hours arranged (CN. 18-591-001) Staff

BMA 691 Advanced Special Topics 1-3
Prerequisite: Permission of instructor
Hours arranged (CN. 18-691-001) Staff

BMA 699 Research Credits Arranged
Prerequisite: As required
Hours arranged (CN. 18-699-001) Staff
Hours arranged (CN. 18-699-002) D. L. Ridgeway

SECOND SESSION

BMA 493 Special Topics in Biomathematics 1-3
Prerequisite: Consent of instructor
Hours arranged (CN. 18-493-001) Staff

BMA 591 Special Topics Maximum 3
Prerequisite: Consent of instructor
Hours arranged (CN. 18-591-001) Staff

BMA 691 Advanced Special Topics 1-3
Prerequisite: Permission of instructor
Hours arranged (CN. 18-691-001) Staff

BMA 699 Research Credits Arranged
Prerequisite: As required
Hours arranged (CN. 18-699-001) Staff
Hours arranged (CN. 18-699-002) D. L. Ridgeway

Botany

FIRST SESSION

BS 100 General Biology 4
(See biological sciences, page 27.)

BO (ZO) 360 Introduction to Ecology 4
(See zoology, page 76.)

BO 499S Independent Study in Botany—Field Botany 3
Prerequisites: At least eight hours of botany, advanced standing, and presentation of plan of work approved by a faculty member
LR 1020-1120 (CN. 19-499-001)
LB 1340-1750 T Th (CN. 19-499-101)

BO 499 Independent Study in Botany 1-3
Prerequisites: At least eight hours of botany, advanced standing, and presentation of plan of work approved by a faculty member
Hours arranged (CN. 19-499-002) Staff

BO 590 Topical Problems 1-3
Prerequisite: Consent of instructor
Hours arranged (CN. 19-590-001) Graduate Staff

BO 693 Special Problems in Botany Credits Arranged
Hours arranged (CN. 19-693-001) Graduate Staff

BO 699 Research Credits Arranged
Hours arranged (CN. 19-699-001) Graduate Staff

SECOND SESSION

BO 200 Plant Life
LR 0800-0930 (CN. 19-200-001)
LB 1340-1750 T Th (CN. 19-200-101)

BO 499 Independent Study in Botany 1-3
Prerequisites: At least eight hours of botany, advanced standing and presentation of plan of work approved by a faculty member
Hours arranged (CN. 19-499-001) Staff

BO 590 Topical Problems 1-3
Prerequisite: Consent of instructor
Hours arranged (CN. 19-590-001) Graduate Staff

BO 693 Special Problems in Botany Credits Arranged
Hours arranged (CN. 19-693-001) Graduate Staff

BO 699 Research Credits Arranged
Hours arranged (CN. 19-699-001) Graduate Staff

Chemical Engineering

FIRST SESSION

CHE 497 Chemical Engineering Projects 1-3
Elective for seniors in chemical engineering
Hours arranged (CN. 20-497-001) Ferrell

CHE 597 Chemical Engineering Projects 1-3
Prerequisite: Graduate standing
Hours arranged (CN. 20-597-001) Ferrell

CHE 699 Research Credits Arranged
Hours arranged (CN. 20-699-001) Graduate Staff

SECOND SESSION

CHE 497 Chemical Engineering Projects 1-3
Elective for seniors in chemical engineering
Hours arranged (CN. 20-497-001) Ferrell

CHE 597 Chemical Engineering Projects 1-3
Prerequisite: Graduate standing
Hours arranged (CN. 20-597-001) Ferrell

CHE 699 Research Credits Arranged
Hours arranged (CN. 20-699-001) Graduate Staff

Chemistry

FIRST SESSION

CH 101 General Chemistry I 4
LR 0800-0930 (CN. 21-101-001)
LB 1340-1750 M W (CN. 21-101-101) Staff
(CN. 21-101-102)
(CN. 21-101-103)

CH 103 General Chemistry II 4
Prerequisite: CH 101
LR 0950-1120 (CN. 21-103-001)
LB 1340-1750 T Th (CN. 21-103-101) Staff
(CN. 21-103-102)
(CN. 21-103-103)

CH 104 Experimental Chemistry 1
Corequisite: CH 105
1340-1750 T Th (CN. 21-104-001) Staff

CH 105 Chemistry—Principles and Applications 3
Prerequisite: CH 101
0950-1120 (CN. 21-105-001) Staff

CH 107 Principles of Chemistry 4
Prerequisite: CH 101 with a grade of C or better
LR 0950-1120 (CN. 21-107-001)
LB 1340-1750 T Th (CN. 21-107-101) Staff
(CN. 21-107-102)

CH 111 Foundations of Chemistry 4
1340-1620 (CN. 21-111-001)

CH 221 Organic Chemistry I 4
Prerequisite: CH 107
*LR 0800-0930 (CN. 21-221-001)
LB 1340-1750 M W (CN. 21-221-101) Staff
LB 1340-1750 M W (CN. 21-221-102)
*LR 0950-1120 (CN. 21-221-002)
LB 1340-1750 T Th (CN. 21-221-103) Staff
LB 1340-1750 T Th (CN. 21-221-104)

CH 223 Organic Chemistry II 4
Prerequisite: CH 221
LR 0800-0930 (CN. 21-223-001)
LB 1340-1750 M W (CN. 21-223-101) Staff
LB 1340-1750 T Th (CN. 21-223-102)

CH 315 Quantitative Analysis 4
Prerequisite: CH 103, or CH 107, or CH 104 and CH 105
LR 0950-1120 (CN. 21-315-001)
LB 1340-1750 T Th (CN. 21-315-101) Staff

CH 331 Introductory Physical Chemistry 4
Prerequisite: CH 103, or CH 107, or CH 104 and CH 105; MA 102 or MA 112
LR 1140-1310 (CN. 21-331-001)
LB 1340-1750 M W (CN. 21-331-101) Staff

CH 431 Physical Chemistry I 3
Prerequisites: CH 107, MA 202, PY 203 or PY 208
Corequisite: MA 301
0800-0930 (CN. 21-431-001) Staff

CH 499 Senior Research in Chemistry 1-3
Prerequisite: Three years chemistry
Hours arranged (CN. 21-499-001) Staff

CH 699 Chemical Research Credits Arranged
Prerequisite: Graduate standing in chemistry
Hours arranged (CN. 21-699-001) Staff

* Students preregistering for this course must list one of the laboratory sections listed immediately following the lecture section.

SECOND SESSION

CH 101 General Chemistry I 4
LR 0800-0930 (CN. 21-101-001)
LB 1340-1750 M W (CN. 21-101-101) Staff
(CN. 21-101-102)

CH 103 General Chemistry II 4
Prerequisite: CH 101
LR 0950-1120 (CN. 21-103-001)
LB 1340-1750 T Th (CN. 21-103-101) Staff
(CN. 21-103-102)

CH 107 Principles of Chemistry 4
Prerequisite: CH 101 with grade of C or better
LR 0950-1120 (CN. 21-107-001)
LB 1340-1750 T Th (CN. 21-107-101) Staff
(CN. 21-107-102)

CH 223 Organic Chemistry II 4
Prerequisite: CH 221
LR 0800-0930 (CN. 21-223-001)
LR 0950-1120 (CN. 21-223-002)
LB 1340-1750 M W (CN. 21-223-101) Staff
(CN. 21-223-102)
(CN. 21-223-103)

CH 499 Senior Research in Chemistry 1-3
Prerequisite: Three years of chemistry
Hours arranged (CN. 21-499-001) Staff

CH 699 Chemical Research Credits Arranged
Prerequisite: Graduate standing in chemistry
Hours arranged (CN. 21-699-001) Staff

Civil Engineering

FIRST SESSION

CE 202 Introduction to Civil Engineering 2
Prerequisite: MA 201
LR 0910-1010 (CN. 22-202-001)
LB 1020-1120 (CN. 22-202-101) Staff

CE 325 Structural Analysis 3
Prerequisite: ESM 301
LR 0800-0900 (CN. 22-325-001)
LB 1340-1620 T Th (CN. 22-325-101) Staff

CE 332 Materials of Construction 3
Prerequisite: MAT 200
LR 1020-1120 (CN. 22-332-001)
LB 1340-1620 M W (CN. 22-332-101) Staff

CE 498 Special Problems in Civil Engineering 1-3
Prerequisite: Senior standing in CE or CEC
Hours arranged (CN. 22-498-001) Staff

CE 598 Civil Engineering Projects 1-6
Hours arranged (CN. 22-598-001) Staff

CE 698 Special Topics in Civil Engineering 1-3
Prerequisite: Graduate standing
Hours arranged (CN. 22-698-001) Staff

CE 699 Civil Engineering Research Credits Arranged
Hours arranged (CN. 22-699-001) Staff

SECOND SESSION

CE 598 Civil Engineering Projects 1-6
Hours arranged (CN. 22-598-001) Staff

CE 698 Special Topics in Civil Engineering 1-3
Prerequisite: Graduate standing
Hours arranged (CN. 22-698-001) Staff

CE 699 Civil Engineering Research Credits Arranged
Hours arranged (CN. 22-699-001) Staff

Computer Science

FIRST SESSION

CSC 101 Introduction to Programming 3
LR 0800-0900 (CN. 23-101-001)
LB 1000-1100 (CN. 23-101-101)
LB 1100-1200 (CN. 23-101-102)
LB 1300-1400 (CN. 23-101-103) Robbins

CSC 112 Basic Computer Organization and Assembly Language 3
Prerequisite: CSC 101 or CSC 111
1140-1310 (CN. 23-112-001) Finger

CSC 200 Introduction to Computers and their Uses 3
A student who has previously taken CSC 101 or CSC 111 may not receive credit for this course.
1140-1310 (CN. 23-200-001) Staff

CSC 301 Principles of Systems Programs 3
Prerequisite: CSC 112
0800-0930 (CN. 23-301-001) Finger

CSC 311 Data Structures 3
Prerequisites: CSC 112 and CSC 102 (or CSC 211)
1340-1510 (CN. 23-311-001) Tharp

CSC 322 Applied Algebraic Structures 3
Prerequisite: MA 231 or MA 405
0950-1120 (CN. 23-322-001) Robbins

SECOND SESSION

CSC 102 Programming Concepts 3
Prerequisite: CSC 101
0950-1120 (CN. 23-102-001) Danielopoulos

CSC 111 Algorithmic Languages I 2
Corequisite: MA 102
LR 1340-1440 (CN. 23-111-001)
LB 0800-0900 M T W Th (CN. 23-111-101)
LB 0910-1010 M T W Th (CN. 23-111-102)
LB 1020-1120 M T W Th (CN. 23-111-103) Lewis

CSC 251 Principles of Programming—FORTRAN 1
To be graded S-NC only.
Prerequisite: CSC 111 or CSC 102
1130-1230 M W F (CN. 23-251-001) Danielopoulos

CSC 252 Principles of Programming—COBOL 1
To be graded S-NC only.
Prerequisite: CSC 101
1340-1440 M W F (CN. 23-252-001) Staff

CSC 302 Introduction to Numerical Methods 3
Prerequisite: CSC 101 or CSC 111
Corequisite: MA 301 or MA 312
0950-1120 (CN. 23-302-001) Lewis

CSC 412 Introduction to Computability, Language and Automata 3
Prerequisite: CSC 322
0800-0930 (CN. 23-412-001) Williamson

Co-op Program

FIRST SESSION AND SECOND SESSION

Engineering Students Only

COP 100E Co-op Work Program 0
Hours arranged (CN. 25-100-001) Hamme

COP 200E Co-op Work Program 0
Hours arranged (CN. 25-200-001) Hamme

COP 300E Co-op Work Program 0
Hours arranged (CN. 25-300-001) Hamme

COP 400E Co-op Work Program 0
Hours arranged (CN. 25-400-001) Hamme

COP 500E Co-op Work Program 0
Hours arranged (CN. 25-500-001) Hamme

Forest Resources Students Only

COP 100F Co-op Work Program 0
Hours arranged (CN. 25-100-002) Saylor

COP 200F Co-op Work Program 0
Hours arranged (CN. 25-200-002) Saylor

COP 300F Co-op Work Program 0
Hours arranged (CN. 25-300-002) Saylor

COP 400F Cop-op Work Program 0
Hours arranged (CN. 25-400-002) Saylor

COP 500F Co-op Work Program 0
Hours arranged (CN. 25-500-002) Saylor

Liberal Arts Students Only

COP 100L Co-op Work Program 0
Hours arranged (CN. 25-100-003) Parker

COP 200L Co-op Work Program 0
Hours arranged (CN. 25-200-003) Parker

COP 300L Co-op Work Program 0
Hours arranged (CN. 25-300-003) Parker

COP 400L Co-op Work Program 0
Hours arranged (CN. 25-400-003) Parker

COP 500L Co-op Work Program 0
Hours arranged (CN. 25-500-003) Parker

Physical and Mathematical Students Only

COP 100P Co-op Work Program 0
Hours arranged (CN. 25-100-004) Patt

COP 200P Co-op Work Program 0
Hours arranged (CN. 25-200-004) Patt

COP 300P Co-op Work Program 0
Hours arranged (CN. 25-300-004) Patt

COP 400P Co-op Work Program 0
Hours arranged (CN. 25-400-004) Patt

COP 500P Co-op Work Program 0
Hours arranged (CN. 25-500-004) Patt

Textiles Students Only

COP 100T Co-op Work Program 0
Hours arranged (CN. 25-100-005) Klibbe

COP 200T Co-op Work Program 0
Hours arranged (CN. 25-200-005) Klibbe

COP 300T Co-op Work Program 0
Hours arranged (CN. 25-300-005) Klibbe

COP 400T Co-op Work Program 0
Hours arranged (CN. 25-400-005) Klibbe

COP 500T Co-op Work Program 0
Hours arranged (CN. 25-500-005) Klibbe

Crop Science

FIRST SESSION

CS (HS) 514 Principles and Methods in Weed Science 3
Prerequisites: CS 414 or equivalent
Special three-week session (June 9-June 27)
0900-1200 (CN. 24-514-001) Coble

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***CS (HS, GN) 542 Plant Breeding Field Procedures** 2
Prerequisite: CS (HS, GN) 541
*Conducted on an arranged basis during the entire summer, terminating approximately August 5. Students should register for the course first session only.
Hours arranged (CN. 24-542-001) Staff

CS 591 Special Problems — Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 24-591-001) — Staff

CS 699 Research — Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 24-699-001) — Staff

SECOND SESSION

CS 591 Special Problems — Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 24-591-001) — Staff

CS 699 Research — Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 24-699-001) — Staff

Design

FIRST SESSION

(This course starts First Session and runs for nine weeks.)

ARC 400 Intermediate Architectural Design (Series) — 4
Prerequisite: DN 202 or equivalent or consent of department
1300-1700 (CN. 13-400-001)

Economics and Business

(Also see Accounting.)

FIRST SESSION

EC 201 Economics I — 3
0800-0930 (CN. 27-201-001) — El-Kammash
0800-0930 (CN. 27-201-002) — Turner
0950-1120 (CN. 27-201-003) — Hughes
1140-1310 (CN. 27-201-004) — Staff

EC 202 Economics II — 3
Prerequisite: EC 201
1140-1310 (CN. 27-202-001) — Hughes

EC 301 Production and Prices — 3
Prerequisites: MA 112 and EC 201 or EC 212
0950-1120 (CN. 27-301-001) — Bird

EC 302 Aggregate Economic Analysis: Theory and Policy — 3
Prerequisites: EC 201 and MA 112
1140-1310 (CN. 27-302-001) — Wilson

EC 307 Business Law I — 3
Prerequisite: EC 201 or EC 212
1140-1310 (CN. 27-307-001) — Holcomb

EC 317 Introduction to Methods of Economic Analysis — 3
Prerequisite: EC 301
0950-1120 (CN. 27-317-001) — Wilson

EC 326 Personnel Management — 3
Prerequisite: EC 201 or EC 212
0800-0930 (CN. 27-326-001) — Brooks
0950-1120 (CN. 27-326-002) — Brooks

EC 401 Economic Analysis for Nonmajors 3
Prerequisite: EC 201 or EC 212
Special three-week session (June 9-June 27)
0900-1200 (CN. 27-401-001) Ikerd, Liner

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EC 475 Comparative Economic Systems 3
Prerequisite: EC 201 or EC 212
1140-1310 (CN. 27-475-001) Turner

EC 490 Senior Seminar in Economics 3
Prerequisites: EC 301 and EC 302 and EC 317 or ST 311 (plus two courses from list of restricted economics electives)
0950-1120 (CN. 27-490-001) Ball

EC 502 Income and Employment Theory 3
Prerequisites: MA 112 and EC 301 and EC 302
0800-0930 (CN. 27-502-001) Lapp

EC 590 Special Economic Topics 3
Prerequisite: Consent of instructor
0950-1120 (CN. 27-590-001) El-Kammash

EC 598 Topical Problems in Economics 1-6
Prerequisite: Consent of instructor
Hours arranged (CN. 27-598-001) Staff

EC 642 Consumption, Demand and Market Interdependency 3
Prerequisites: EC 501 and ST 513
(Eight week's course, May 21-July 11)
1210-1340 M W F (CN. 27-642-001) King

EC 699 Research in Economics Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 27-699-001) Staff

SECOND SESSION

EC 201 Economics I 3
0800-0930 (CN. 27-201-001) Fearn
0800-0930 (CN. 27-201-002) Staff
0950-1120 (CN. 27-201-003) Palmer
0950-1120 (CN. 27-201-004) Fearn

EC 202 Economics II 3
Prerequisite: EC 201
0950-1120 (CN. 27-202-001) Fearn

EC 301 Production and Prices 3
Prerequisites: MA 112 and EC 201 or EC 212
0800-0930 (CN. 27-301-001) Palmer

EC 302 Aggregate Economic Analysis: Theory and Policy 3
Prerequisites: EC 201 and MA 112
0950-1120 (CN. 27-302-001) Bird

EC 304 Financial Institutions 3
Prerequisite: EC 201
1140-1310 (CN. 27-304-001) Jones

EC 307 Business Law I 3
Prerequisite: EC 201 or EC 212
0800-0930 (CN. 27-307-001) Pinna

EC 310 Economics of the Firm 3
Prerequisite: EC 201 or EC 212
0800-0930 (CN. 27-310-001) Kanyr

EC 420 Corporation Finance 3
Prerequisites: EC 201 or EC 212, and ACC 260
0950-1120 (CN. 27-420-001) Jones

EC 490 Senior Seminar in Economics 3
Prerequisites: EC 301 and EC 302 and EC 317 or ST 311 (plus two courses from list of restricted economics electives)
0950-1120 (CN. 27-490-001) Harrell

EC 501 Price Theory 3
Prerequisites: MA 112 and EC 301
1140-1310 (CN. 27-501-001) Harrell

EC 598 Topical Problems in Economics 1-6
Prerequisite: Consent of instructor
Hours arranged (CN. 27-598-001)

EC 699 Research in Economics Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 27-699-001) Staff

Education

FIRST SESSION

ED 344 School and Society 3
Prerequisite: Junior or senior standing
0800-0930 (CN. 28-344-001) Ivie
0950-1120 (CN. 28-344-002)

ED 421 Principles and Practices in Industrial Cooperative Training 3
Prerequisites: ED 327, ED 344
0800-0930 (CN. 28-421-001) Timm

ED 428 Organization of Related Study Materials 3
Prerequisites: ED 327, ED 344
0950-1120 (CN. 28-428-001) Timm

***ED 457 Organization and Management of Youth Club Activities** 3
Prerequisite: Junior standing
0800-1120 (CN. 28-457-001) Parker
1340-1650 (CN. 28-457-002)
*Special three-week course (June 9-June 27)

***ED 483 An Introduction to Instructional Media** 3
Prerequisite: Advanced undergraduate standing
LR 0900-1130 (CN. 28-483-001) Gibson
LB 1340-1630 (CN. 28-483-101)
*Special three-week course (June 9-June 27)

ED 496 Senior Seminar in Education 1-3
Prerequisite: Permission of instructor
Hours arranged (CN. 28-496-001) Staff

ED (SOC) 501 Leadership 3
(See sociology, page 70.)

ED 503 The Programming Process in Adult and Community College Education 3
Prerequisites: ED 501, permission of instructor
0800-0900 (CN. 28-503-001) Boone

ED 525 Trade Analysis and Course Construction 3
Prerequisites: ED 344, PSY 304
0800-0930 (CN. 28-525-001) Shore

ED 537 The Extension and Public Service Function in Higher Education 3
Prerequisite: ED 510
Special three-week course (June 9-June 27)
0900-1200 (CN. 28-537-001) Dubois

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ED 570 Foundations of Mathematics Education 3
Prerequisites: ED 471 or equivalent
1900-2100 (CN. 28-570-001) Kolb

ED 591 Special Problems in Industrial Education Maximum 6
Prerequisites: Six hours graduate credit, consent of instructor
Hours arranged (CN. 28-591-001) Hanson

ED 593 Special Problems in Agricultural Education Credits Arranged
Prerequisite: ED 411 or equivalent
Hours arranged (CN. 28-593-001) Miller

ED 596 Topical Problems in Adult and Community College Education
Credits Arranged

Prerequisite: Graduate standing
Hours arranged (CN. 28-596-001) Staff-Credits Arranged
*0900-1200 (CN. 28-596-002) O'Connell—3
*1300-1600 (CN. 28-596-003) Bender—3
*1300-1600 (CN. 28-596-004) Knowles—3
*0900-1200 (CN. 28-596-005) Robinson—3
*1300-1600 (CN. 28-596-006) Valentine—3
*Special three-week session (June 9-June 27)
See page 22 for list of topics.

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ED 597 Special Problems in Education Credits Arranged, 1-3
Prerequisites: Graduate standing and consent of instructor
Hours arranged (CN. 28-597-001) Staff

ED 598 Concepts and Strategies of Understanding, Motivating and Teaching Disadvantaged Adults 3
Prerequisite: Graduate standing
Special three-week course (June 9-June 27)
0900-1200 (CN. 28-598-001) Brown

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ED 600 Organization Concepts and Theories Applied to Adult and Community College Education 3
Prerequisites: ED 503, PS 502, SOC 541
1030-1200 (CN. 28-600-001) Shearon

ED 621 Internship in Education 3-9
Prerequisites: Nine credit hours in graduate level courses and consent of instructor
Hours arranged (CN. 28-621-001) Staff

ED 641 Laboratory and Practicum Experiences in Counseling 2-6
Prerequisites: Advanced graduate standing, consent of instructor
1610-1730 (CN. 28-641-001) Martin—3
1610-1730 (CN. 28-641-002) Poole—3

ED 693 Advanced Problems in Agricultural Education Credits Arranged
Prerequisites: ED 554 or equivalent
Hours arranged (CN. 28-693-001) Miller

ED 699 Research Credits Arranged
Prerequisites: 15 hours, consent of adviser
Hours arranged (CN. 28-699-001) Staff

SECOND SESSION

ED (PHI) 304 Philosophy of Education 3
(See philosophy, page 61.)

ED 496 Senior Seminar in Education 1-3
Prerequisite: Permission of instructor
Hours arranged (CN. 28-496-001) Staff

ED 500 The Community College System 3
Prerequisite: Graduate or advanced undergraduate standing
0800-0930 (CN. 28-500-001) Gragg

ED 504 Principles and Practices of Introduction to Vocations 3
Prerequisites: Twelve hours in education
0800-0930 (CN. 28-504-001) Cox

ED 506 Education of Exceptional Children 3
Prerequisites: Six hours education or psychology
0800-0930 (CN. 28-506-001) McCutchen
Hours arranged (CN. 28-506-002)

ED 507 Analysis of Reading Abilities 3
Prerequisites: Six hours education or psychology
0800-0930 (CN. 28-507-001) Staff

ED 508 Improvement of Reading Abilities 3
Prerequisites: Six hours education or psychology
0950-1120 (CN. 28-508-001) Staff

ED 509 a Methods and Materials—Teaching Retarded Children 3
Trainable
Prerequisite: ED 506
0950-1120 (CN. 28-509-001)

ED 509 b Methods and Materials—Teaching Retarded Children 3
Educable
Prerequisite: ED 506
0950-1120 (CN. 28-509-002)

ED 520 Personnel and Guidance Services 3
Prerequisites: Six hours in education or psychology
0800-0930 (CN. 28-520-001) Jones

ED 522 Career Exploration 3
Prerequisites: ED 344; Graduate status or permission of instructor
1140-1310 (CN. 28-522-001) Cox

ED 524 Occupational Information 3
Prerequisites: Six hours education or psychology, ED 520 or equivalent
0950-1120 (CN. 28-524-001) Hopke

ED 527 Philosophy of Occupational Education 3
Prerequisite: Graduate standing
0950-1120 (CN. 28-527-001) Bryant

ED 528 Cooperative Occupational Education 3
Prerequisite: Permission of instructor
0950-1120 (CN. 28-528-001) Smith

ED 530 Group Guidance 3
Prerequisites: Six hours education or psychology, ED 520 or equivalent
1140-1310 (CN. 28-530-001) Galassi

ED (PSY) 531 Mental Deficiency 3
Prerequisites: Nine hours psychology and special education
0800-0930 (CN. 28-531-001) Staff

ED 533 Organization and Administration of Guidance Services 3
Prerequisites: Graduate standing, ED 520 or equivalent
1140-1310 (CN. 28-533-001) Morehead

ED 534 Guidance in the Elementary School 3
Prerequisites: Nine hours psychology or consent of instructor
0950-1120 (CN. 28-534-001) Galassi

ED 538 Instructional Strategies in Adult and Community College Education 3
Prerequisites: Graduate standing and ED 559
1030-1200 (CN. 28-538-001) Segner

ED 554 Planning Programs in Agricultural Education 3
Prerequisites: ED 411 or equivalent
1340-1510 (CN. 28-554-001) Bryant

ED 591 Special Problems in Industrial Education Maximum 6
Prerequisites: Six hours graduate credit, consent of department head
Hours arranged (CN. 28-591-001) Hanson

ED 592 Special Problems in Mathematics Teaching 3
Prerequisites: ED 471 or equivalent
0950-1120 (CN. 28-592-001) Speece
To be taught jointly with ED 594

ED 593 Special Problems in Agricultural Education Credits Arranged
Prerequisites: ED 411 or equivalent
Hours arranged (CN. 28-593-001) Miller

ED 594 Special Problems in Science Teaching 3
Prerequisite: ED 476 or equivalent
0950-1120 (CN. 28-594-001) Speece
To be taught jointly with ED 592

ED 596 Topical Problems in Adult and Community College Education Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 28-596-001) Staff

***ED 597 a Special Problems in Education** 3
Education of the Gifted
Prerequisites: Graduate standing and consent of instructor
*Three-week course (July 1-July 22)
0800-1140 (CN. 28-597-001) Staff
0800-1140 (CN. 28-597-002) Staff

***ED 597 b Special Problems in Education** 3
Reading for the Visually Handicapped
Prerequisites: Graduate standing and consent of instructor
*Three-week course (July 1-July 22)
Hours arranged (CN. 28-597-003) Staff

ED 611 Laws, Regulations and Policies Affecting Vocational Education 3
Prerequisites: ED 527, ED 610 or equivalent
0800-0930 (CN. 28-611-001) Nerden

ED 612 Finance, Accounting and Management of Vocational Education Programs 3
Prerequisites: ED 527, ED 610 or equivalent
0950-1120 (CN. 28-612-001) Nerden

ED 615 Introduction to Educational Research 3
Prerequisite: PSY 535 or equivalent
0950-1120 (CN. 28-615-001) Staff
1340-1510 (CN. 28-615-002) Staff

ED 621 Internship in Education 3-9
Prerequisites: Nine credit hours in graduate level courses and consent of instructor
Hours arranged (CN. 28-621-001) Staff

ED 633 Techniques of Counseling 3
Prerequisites: Nine hours from the following fields: EC, ED, PSY or SOC
0950-1120 (CN. 28-633-001) Jones

ED 693 Advanced Problems in Agricultural Education Credits Arranged
Prerequisites: ED 554 or equivalent
Hours arranged (CN. 28-693-001) Miller

ED 699 Research Credits Arranged
Prerequisites: Fifteen hours, consent of adviser
Hours arranged (CN. 28-699-001) Staff

Electrical Engineering

FIRST SESSION

EE 202 Electric Circuits II 4
Prerequisites: EE 201, MA 201
Offered only in a 12-week sequence. The course counts for two semester hours in calculating load for each session. Students should register for four semester hours at registration for First Session only.
LR 0800-0900 (CN. 30-202-001) Seagraves
LR 0910-1010 (CN. 30-202-002) Seagraves
LB 1300-1500 M W (CN. 30-202-101) Staff
LB 1500-1700 M W (CN. 30-202-102) Staff
LB 1300-1500 T Th (CN. 30-202-103) Staff
LB 1500-1700 T Th (CN. 30-202-104) Staff

EE 213 Electric Circuits I Lab 1
Prerequisite: EE 211
1500-1700 T Th (CN. 30-213-001) Staff

EE 332 Principles of Electrical Engineering 3
Prerequisite: EE 331
0730-0900 (CN. 30-332-001) Barclay

EE 530 Physical Electronics 3
Prerequisites: EE 304, B average in electrical engineering and mathematics
Hours arranged (CN. 30-530-001) Hauser

EE 540 Electromagnetic Fields and Waves 3
Prerequisites: EE 304, B average in electrical engineering and mathematics
Hours arranged (CN. 30-540-001) Reeves

EE 592 Special Topics in Electrical Engineering 3
(Small Computer Design and Application)
Prerequisites: B average in technical subjects
Hours arranged (CN. 30-592-001) Gault

EE 699 Electrical Engineering Research Credits Arranged
Prerequisite: Graduate standing in electrical engineering and approval of adviser
Hours arranged (CN. 30-699-001) Staff

SECOND SESSION

EE 202 Electric Circuits II
(See First Session)

EE 350 Electric Power Utilization in Manufacturing Processes 3
Prerequisites: PY 212, MA 201
Not available to undergraduates in electrical engineering.
LR 0950-1120 (CN. 30-350-001) Easter
LB 1340-1620 (CN. 30-350-101) Easter

EE 699 Electrical Engineering Research Credits Arranged
Prerequisites: Graduate standing in electrical engineering and approval of adviser
Hours arranged (CN. 30-699-001) Staff

Engineering (General Courses)

FIRST SESSION

E 101 Engineering Graphics I 2
0800-0930 (CN. 31-101-001) Staff
0950-1120 (CN. 31-101-002) Staff

E 207 Engineering Graphics II 2
Prerequisite: E 101
0730-0940 (CN. 31-207-001) Staff

SECOND SESSION

E 101 Engineering Graphics I 2
0800-0930 (CN. 31-101-001) Staff
0950-1120 (CN. 31-101-002) Staff

Engineering Science and Mechanics

FIRST SESSION

ESM 200 Introduction to Mechanics 3
Corequisite: MA 202
0800-0930 (CN. 34-200-001) Mettrey

ESM 205 Principles of Engineering Mechanics 3
Prerequisite: PY 205
Corequisite: MA 202
0950-1120 (CN. 34-205-001) Hayes

ESM 301 Mechanics of Solids 3
Prerequisite: ESM 200
0800-0930 (CN. 34-301-001) Gurley

ESM 303 Fluid Mechanics I 3
Prerequisite: ESM 200 or ESM 205
0950-1120 (CN. 34-303-001) Edwards

ESM 305 Engineering Dynamics 3
Prerequisite: ESM 205
Corequisite: MA 301
0800-0930 (CN. 34-305-001) Clayton

ESM 307 Solids Mechanics I 3
Prerequisite: ESM 205
Corequisite: MA 301
0950-1120 (CN. 34-307-001) Gurley

ESM 699 Research In Mechanics Credits Arranged
Hours arranged (CN. 34-699-001) Staff

SECOND SESSION

ESM 200 Introduction to Mechanics 3
Corequisite: MA 202
0800-0930 (CN. 34-200-001) Bingham

ESM 205 Principles of Engineering Mechanics 3
Prerequisite: PY 205
Corequisite: MA 202
0950-1120 (CN. 34-205-001) Bingham

ESM 301 Mechanics of Solids 3
Prerequisite: ESM 200
0800-0930 (CN. 34-301-001) Horie

ESM 303 Fluid Mechanics I 3
Prerequisite: ESM 200 or ESM 205
0950-1120 (CN. 34-303-001) Sheffield

ESM 305 Engineering Dynamics 3
Prerequisite: ESM 205
Corequisite: MA 301
0800-0930 (CN. 34-305-001) Maday

ESM 307 Solids Mechanics I 3
Prerequisite: ESM 205
Corequisite: MA 301
0950-1120 (CN. 34-307-001) Liddell

ESM 699 Research in Mechanics Credits Arranged
Hours arranged (CN. 34-699-001) Staff

English

FIRST SESSION

ENG 111 Composition and Rhetoric 3
General University requirement.
0800-0930 (CN. 36-111-001) Staff
0950-1120 (CN. 36-111-002) Staff
1140-1310 (CN. 36-111-003) Staff

ENG 112 Composition and Reading 3
General University requirement.
Prerequisite: ENG 111
0800-0930 (CN. 36-112-001) Staff
0950-1120 (CN. 36-112-002) Staff
1140-1310 (CN. 36-112-003) Staff

NOTE: *The prerequisite for all advanced courses in writing, language, or literature is the completion of ENG 111 and ENG 112. Desirable preparation for literature courses of the 300 level or above is ENG 205, ENG 206, ENG 207, ENG 208 or any semester of ENG 261, ENG 262 or ENG 265, ENG 266.*

ENG 205 Studies in Great Works of Literature 3
The courses ENG 205, ENG 206, ENG 207 and ENG 208 are designed for students not enrolled in Liberal Arts.
0800-0930 (CN. 36-205-001) Staff
0950-1120 (CN. 36-205-002) Staff
1140-1310 (CN. 36-205-003) Staff

ENG 208 Studies in Fiction 3
The courses ENG 205, ENG 206, ENG 207 and ENG 208 are designed for students not enrolled in Liberal Arts.
0950-1120 (CN. 36-208-001) Staff
1140-1310 (CN. 36-208-002) Staff

ENG 261 English Literature I 3
0800-0930 (CN. 36-261-001) Staff
0950-1120 (CN. 36-261-002) Staff

ENG 265 American Literature I 3
0800-0930 (CN. 36-265-001) Staff
0950-1120 (CN. 36-265-002) Staff
1140-1310 (CN. 36-265-003) Staff

ENG 321 The Communication of Technical Information 3
0800-0930 (CN. 36-321-001) Dandridge
0950-1120 (CN. 36-321-002) Dandridge

ENG 398 Contemporary Literature I (1900 to 1940) 3
1140-1310 (CN. 36-398-001) Reynolds

ENG 451 Chaucer 3
0800-0930 (CN. 36-451-001) Short

ENG 480 Modern Drama 3
0950-1120 (CN. 36-480-001) Knowles

ENG 575 Southern Writers 3
Prerequisite: ENG 266 or equivalent
0950-1120 (CN. 36-575-001) Lucas

FOR GRADUATES ONLY

ENG 681 20th-Century American Drama 3
1140-1310 (CN. 36-681-001) Halperen

ENG 699 Research in Literature (Thesis) Credits Arranged
Prerequisite: Consent of graduate adviser
Hours arranged (CN. 36-699-001) Graduate Staff

SECOND SESSION

ENG 111 Composition and Rhetoric 3
General University requirment.
0800-0930 (CN. 36-111-001) Staff
0950-1120 (CN. 36-111-002) Staff
1140-1310 (CN. 36-111-003) Staff

ENG 112 Composition and Reading 3
General University requirement.
Prerequisite: ENG 111
0800-0930 (CN. 36-112-001) Staff
0950-1120 (CN. 36-112-002) Staff
1140-1310 (CN. 36-112-003) Staff

NOTE: *The prerequisite for all advanced courses in writing, language, or literature is the completion of ENG 111 and ENG 112. Desirable preparation for literature courses of the 300 level or above is ENG 205, ENG 206, ENG 207, and ENG 208 or any semester of ENG 261, ENG 262 or ENG 265, ENG 266.*

ENG 205 Studies in Great Works of Literature 3
The courses ENG 205, ENG 206, ENG 207 and ENG 208 are designed for students not enrolled in Liberal Arts.
0800-0930 (CN. 36-205-001) Staff
0950-1120 (CN. 36-205-002) Staff
1140-1310 (CN. 36-205-003) Staff

ENG 208 Studies in Fiction 3
The courses ENG 205, ENG 206, ENG 207 and ENG 208 are designed for students not enrolled in Liberal Arts.
0800-0930 (CN. 36-208-001) Staff
0950-1120 (CN. 36-208-002) Staff

ENG 262 English Literature II 3
0800-0930 (CN. 36-262-001) Staff
0950-1120 (CN. 36-262-002) Staff

ENG 266 American Literature II 3
0800-0930 (CN. 36-266-001) Staff
0950-1120 (CN. 36-266-002) Staff
1140-1310 (CN. 36-266-003) Staff

ENG 321 The Communication of Technical Information 3
0800-0930 (CN. 36-321-001) Staff

ENG 369 American Novel of the 19th Century 3
1140-1310 (CN. 36-369-001) Kilby

ENG 371 The Modern Novel 3
0950-1120 (CN. 36-371-001) C. Moore

ENG 469 American Realism and Naturalism 3
0800-0930 (CN. 36-469-001) Jeffers

ENG 485 Shakespeare 3
0950-1120 (CN. 36-485-001) Blank

ENG 561 Milton 3
Prerequisite: ENG 261 or equivalent
1140-1310 (CN. 36-561-001) White

FOR GRADUATES ONLY

ENG 651 Studies in Chaucer 3
Prerequisite: ENG 451 or equivalent
0800-0930 (CN. 36-651-001) Koonce

ENG 699 Research in Literature (Thesis) Credits Arranged
Prerequisite: Consent of graduate adviser
Hours arranged (CN. 36-699-001)

Entomology

FIRST SESSION

ENT 590 Special Problems Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 38-590-001) Staff

ENT 699 Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 38-699-001) Graduate Staff

SECOND SESSION

ENT (BS) 410 Biology of Insects 3
Prerequisite: ZO 201 or ZO 202
Hours arranged (CN. 38-410-001) Staff

ENT 590 Special Problems Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 38-590-001) Staff

ENT 699 Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 38-699-001) Graduate Staff

Food Science

FIRST SESSION

FS 491 Special Topics in Food Science Maximum 6
Prerequisite: Senior standing or consent of instructor
Hours arranged (CN. 39-491-001) Staff

FS 591 Special Problems in Food Science — Maximum 6
Prerequisite: Senior or graduate standing
Hours arranged (CN. 39-591-001) — Graduate Staff

FS 691 Special Research Problems in Food Science — Credits Arranged
Hours arranged (CN. 39-691-001) — Graduate Staff

FS 699 Research in Food Science — Credits Arranged
Hours arranged (CN. 39-699-001) — Graduate Staff

SECOND SESSION

FS 491 Special Topics in Food Science — Maximum 6
Prerequisite: Senior standing or consent of instructor
Hours arranged (CN. 39-491-001) — Staff

FS 591 Special Problems in Food Science — Maximum 6
Prerequisite: Senior or graduate standing
Hours arranged (CN. 39-591-001) — Graduate Staff

FS 691 Special Research Problems in Food Science — Credits Arranged
Hours arranged (CN. 39-691-001) — Graduate Staff

FS 699 Research in Food Science — Credits Arranged
Hours arranged (CN. 39-699-001) — Graduate Staff

Foreign Languages and Literatures

French

FIRST SESSION

MLF 101 Elementary French I — 3
0800-0930 (CN. 64-101-001) — Hughes

MLF 201 Intermediate French I — 3
Prerequisite: MLF 102
0950-1120 (CN. 64-201-001) — Hughes
0950-1120 (CN. 64-201-002) — Allred

MLF 401 French for Graduate Students — 0
Not open to undergraduates.
1140-1310 (CN. 64-401-001) — Allred

SECOND SESSION

MLF 102 Elementary French II — 3
Prerequisite: MLF 101
0800-0930 (CN. 64-102-001) — de la Querière

MLF 202 Intermediate French II — 3
Prerequisite: MLF 201
0950-1120 (CN. 64-202-001) — de la Querière

German

FIRST SESSION

MLG 101 Elementary German I — 3
0800-0930 (CN. 65-101-001) — Tucker

MLG 201 Intermediate German I — 3
Prerequisite: MLG 102
0930-1120 (CN. 65-201-001) — Tucker

SECOND SESSION

MLG 102 Elementary German II 3
Prerequisite: MLG 101
0800-0930 (CN. 65-102-001) Simonsen

MLG 202 Intermediate German II 3
Prerequisite: MLG 201
0930-1120 (CN. 65-202-001) Simonsen

Russian

FIRST SESSION

MLR 101 Elementary Russian I 3
1140-1310 (CN. 67-101-001) Jezierski

Spanish

FIRST SESSION

MLS 101 Elementary Spanish I 3
0800-0930 (CN. 68-101-001) G. Gonzalez
0800-0930 (CN. 68-101-002) Kelly

MLS 102 Elementary Spanish II 3
Prerequisite: MLS 101
0950-1120 (CN. 68-102-001) Kelly

MLS 201 Intermediate Spanish I 3
Prerequisite: MLS 102
0930-1120 (CN. 68-201-001) G. Gonzalez
0930-1120 (CN. 68-201-002) Jezierski

SECOND SESSION

MLS 102 Elementary Spanish II 3
Prerequisite: MLS 101
0800-0930 (CN. 68-102-001) Kloe
0800-0930 (CN. 68-102-002) Reynolds

MLS 202 Intermediate Spanish II 3
Prerequisite: MLS 201
0950-1120 (CN. 68-202-001) Kloe
0950-1120 (CN. 68-202-002) Reynolds

Forestry

FIRST SESSION

FOR 204 Silviculture 2
Sophomore Summer Camp
Prerequisite: Junior standing in FOR
0800-1700 (CN. 40-204-001) Duffield

FOR 263 Dendrology 1
Sophomore Summer Camp
Prerequisite: FOR 210, FOR 211
0800-1700 (CN. 40-263-001) Duffield

FOR 264 Forest Protection 2
Sophomore Summer Camp
Prerequisite: Junior standing in FOR
0800-1700 (CN. 40-264-001) Staff

FOR 274 Mapping and Mensuration 4
Sophomore Summer Camp
Prerequisite: FOR 272
0800-1700 (CN. 40-274-001) Steensen, Jervis

FOR 284 Utilization 1
Sophomore Summer Camp
Prerequisite: Junior standing in FOR
0800-1700 (CN. 40-284-001) Gemmer

FOR 491 Senior Problems in Forest Resources Credits Arranged
Prerequisite: Consent of department
Hours arranged (CN. 40-491-001) Staff

FOR 591 Forestry Problems Credits Arranged
Prerequisite: Advanced undergraduate or graduate standing
Hours arranged (CN. 40-591-001) Staff

FOR 692 Advanced Forest Management Problems Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 40-692-001) Staff

FOR 699 Problems in Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 40-699-001) Staff

SECOND SESSION

FOR 491 Senior Problems in Forest Resources Credits Arranged
Prerequisite: Consent of department
Hours arranged (CN. 40-491-001) Staff

FOR 591 Forestry Problems Credits Arranged
Prerequisite: Advanced undergraduate or graduate standing
Hours arranged (CN. 40-591-001) Staff

FOR 692 Advanced Forest Management Problems Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 40-692-001) Staff

FOR 699 Problems in Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 40-699-001) Staff

Genetics

FIRST SESSION

FOR UNDERGRADUATES

GN 301 Genetics in Human Affairs 3
(Students should have sophomore standing.)
0800-0930 (CN. 41-301-001) McKenzie, Voelker

FOR ADVANCED UNDERGRADUATES

GN 411 The Principles of Genetics 3
Prerequisites: BS 100 (Junior standing)
1140-1310 (CN. 41-411-001) McKenzie, Voelker

FOR GRADUATES ONLY

GN (CS, HS) 542 Plant Breeding Field Procedures 2
(See crop science, page 34.)

GN 695 Special Problems in Genetics 1-3
Prerequisites: Advanced graduate standing and consent of instructor
Hours arranged (CN. 41-695-001) Graduate Staff

GN 699 Research Credits Arranged
Prerequisites: Graduate standing, consent of instructor
Hours arranged (CN. 41-699-001) Graduate Staff

SECOND SESSION

GN 695 Special Problems in Genetics 1-3
Prerequisites: Advanced graduate standing and consent of instructor
Hours arranged (CN. 41-695-001) Graduate Staff

GN 699 Research Credits Arranged
Prerequisites: Graduate standing, consent of instructor
Hours arranged (CN. 41-699-001) Graduate Staff

Geology

FIRST SESSION

GY 593 Advanced Topics in Geology 1-6
Prerequisite: Consent of staff
Hours arranged (CN. 43-593-001) Staff

GY 699 Geological Research Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 43-699-001) Staff

SECOND SESSION

GY 500 Regional Geology of North America 3
Prerequisites: GY 101 or GY 120, senior standing
Hours arranged (CN. 43-500-001) Carson, Spence

GY 593 Advanced Topics in Geology 1-6
Prerequisite: Consent of staff
Hours arranged (CN. 43-593-001) Staff

GY 699 Geological Research Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 43-699-001) Staff

History

FIRST SESSION

HI 205 Western Civilization Since 1400 3
0800-0930 (CN. 44-205-001) Nelson

HI 210 Europe in the Nineteenth Century 3
0950-1120 (CN. 44-210-001) Nelson

HI 233 The World in the 20th Century 3
0800-0930 (CN. 44-233-001) Czupryna

HI 240 The Founding of American Civilization 3
0800-0930 (CN. 44-240-001) Constantin

HI 241 America From Colonies to Nation, 1750-1789 3
1140-1310 (CN. 44-241-001) Constantin

HI 242 United States, 1789-1845 3
1140-1310 (CN. 44-242-001) Mulholland

HI 243 United States, 1845-1914 3
0950-1120 (CN. 44-243-001) Crisp

HI 244 United States Since 1914 3
0800-0930 (CN. 44-244-001) Hobbs

HI 264 Modern East Asia: 1800 to Present 3
1140-1310 (CN. 44-264-001) Czupryna

HI 341 Technology in History 3
Prerequisite: Three hours of history
0950-1120 (CN. 44-341-001) Mulholland

HI 452 Recent America 3
Prerequisite: Three hours of history
0950-1120 (CN. 44-452-001) Hobbs

HI 461 Civilization of Old South 3
Prerequisite: Three hours of history
1140-1310 (CN. 44-461-001) Crisp

SECOND SESSION

HI 204 Western Civilization to 1400 3
0950-1120 (CN. 44-204-001) Sack

HI 207 The Ancient World to 180 A.D. 3
0800-0930 (CN. 44-207-001) Sack

HI 208 The Middle Ages 3
0800-0930 (CN. 44-208-001) Riddle

HI 216 Latin America Since 1826 3
0800-0930 (CN. 44-216-001) Beezley

HI 241 America From Colonies to Nation, 1750-1789 3
0950-1120 (CN. 44-241-001) Elliott

HI 243 United States, 1845-1914 3
0800-0930 (CN. 44-243-001) Harris

HI 244 United States Since 1914 3
0950-1120 (CN. 44-244-001) Kearney

HI 404 Rome to 180 A.D. 3
Prerequisite: Three hours of history
1140-1310 (CN. 44-404-001) Riddle

HI 463 North Carolina to 1860 3
Prerequisite: Three hours of history
0800-0930 (CN. 44-463-001) Elliott

HI 469 Twentieth Century Latin American Revolutions 3
Prerequisite: Three hours of history
0950-1120 (CN. 44-469-001) Beezley

HI 545 The American Civil War 3
Prerequisite: Six hours of advanced history or equivalent
0950-1120 (CN. 44-545-001) Harris

Horticultural Science

FIRST SESSION

HS 212 Ornamental Plants 3
Prerequisite: BS 100
LR 0910-1230 (CN. 45-212-001) R. M. Southall

HS 495 Special Topics in Horticultural Science Credits Arranged, 1-6
Hours arranged (CN. 45-495-001) Staff

HS (CS) 514 Principles and Methods in Weed Science 3
(See crop science, page 34.)

HS (CS, GN) 542 Plant Breeding Field Procedures 2
(See crop science, page 34.)

HS 599 Research Principles Credits Arranged, Maximum 6
Prerequisite: Consent of instructor
Hours arranged (CN. 45-599-001) Graduate Staff

HS 699 Research Credits Arranged
Prerequisites: Graduate standing in horticulture, consent of advisory committee chairman
Hours arranged (CN. 45-699-001) Graduate Staff

SECOND SESSION

HS 495 Special Topics in Horticultural Science Credits, Arranged, 1-6
Hours arranged (CN. 45-495-001) Staff

HS 599 Research Principles Credits Arranged, Maximum 6
Prerequisites: Consent of instructor
Hours arranged (CN. 45-599-001) Graduate Staff

HS 699 Research Credits Arranged
Prerequisites: Graduate standing in horticulture, consent of advisory committee chairman
Hours arranged (CN. 45-699-001) Graduate Staff

Industrial Arts

FIRST SESSION

IA 122 Metal Technology I 3
1020-1300 (CN. 47-122-001) Mayer

IA 246 Graphics Technology 3
Prerequisite: Tech. drawing course
1340-1620 (CN. 47-246-001) Mayer

IA 351 General Ceramics 3
1020-1300 (CN. 47-351-001) Patterson
1340-1620 (CN. 47-351-002)

IA 359 Electrical Technology I 3
Prerequisites: MA 111, PY 212, or PY 221
0730-1010 (CN. 47-359-001) Young

IA 590 Laboratory Problems in Industrial Arts Variable Credits, Maximum 6
Prerequisites: Senior standing, permission of instructor
1200-1300 (CN. 47-590-001) Young

IA 592 Special Problems in Industrial Arts Variable Credits, Maximum 6
Prerequisites: One term of student teaching or equivalent
1200-1300 (CN. 47-592-001) Young

SECOND SESSION

IA 115 Wood Processing I 3
0730-1010 (CN. 47-115-001) Baker

IA 203 Technical Sketching 2
0730-0900 (CN. 47-203-001) Troxler

IA 368 Technical Drawing II 3
Prerequisite: E 101 or IA 113
1020-1300 (CN. 47-368-001) Troxler

IA 510 Design for Industrial Arts Teachers 3
Prerequisites: Six hours of drawing and IA 205 or equivalent
1020-1120 (CN. 47-510-001) Baker

IA 590 Laboratory Problems in Industrial Arts Variable Credits, Maximum 6
Prerequisites: Senior standing, permission of instructor
1200-1300 (CN. 47-590-001) Staff

IA 592 Special Problems in Industrial Arts Variable Credits, Maximum 6
Prerequisite: One term of student teaching or equivalent
1200-1300 (CN. 47-592-001) Staff

Industrial Engineering

FIRST SESSION

IE 591 Project Work 1-6
Prerequisite: Graduate or senior standing
Hours arranged (CN. 49-591-001) Staff

IE (OR, MA) 692 Special Topics in Mathematical Programming 3
(See operations research, page 60.)

IE 699 Industrial Engineering Research Credits Arranged
Hours arranged (CN. 49-699-001)

SECOND SESSION

IE (OR, MA) 505 Mathematical Programming I 3
(See operations research, page 60.)

IE 591 Project Work 1-6
Prerequisite: Graduate or senior standing
Hours arranged (CN. 49-591-001)

IE (OR, MA) 692 Special Topics in Mathematical Programming 3
(See operations research, page 61.)

IE 699 Industrial Engineering Research Credits Arranged
Hours arranged (CN. 49-699-001)

Marine Sciences

FIRST SESSION

MAS (OY) 699 Research in Physical Oceanography Credits Arranged
(See physical oceanography, page 63.)

SECOND SESSION

MAS (OY) 699 Research in Physical Oceanography — Credits Arranged
(See physical oceanography, page 63.)

Materials Engineering

FIRST SESSION

MAT 200 Mechanical Properties of Structural Materials — 2
Prerequisite: CH 105 and the first course in engineering science and mechanics

LR 1100-1200 M W F	(CN. 61-200-001)	Fahmy
LB 1300-1730 T Th	(CN. 61-200-101)	Fahmy, Staff
	(CN. 61-200-102)	

MAT 201 Structure and Properties of Engineering Materials — 3
Prerequisite: CH 105

LR 1200-1300	(CN. 61-201-001)	Fahmy
LB 1300-1600 M W F	(CN. 61-201-101)	Staff
	(CN. 61-201-102)	

MAT 495 Materials Engineering Projects — 1-6
Prerequisite: Junior or senior standing
Hours arranged (CN. 61-495-001) — Staff

MAT 595 Advanced Materials Experiments — 1-3
Prerequisite: Senior or graduate standing
Hours arranged (CN. 61-595-001) — Staff

MAT 699 Materials Engineering Research — Credits Arranged
Hours arranged (CN. 61-699-001)

SECOND SESSION

MAT 201 Structure and Properties of Engineering Materials — 3
Prerequisite: CH 105

LR 1200-1300	(CN. 61-201-001)	Fahmy
LB 1300-1600 M W F	(CN. 61-201-101)	Staff
	(CN. 61-201-102)	

MAT 495 Materials Engineering Projects — 1-6
Prerequisite: Junior or senior standing
Hours arranged (CN. 61-495-001) — Staff

MAT 595 Advanced Materials Experiments — 1-3
Prerequisite: Senior or graduate standing
Hours arranged (CN. 61-595-001) — Staff

MAT 692 Special Topics in Materials Engineering — 1-3
Prerequisite: Graduate standing
Hours arranged (CN. 61-692-001) — Staff

MAT 699 Materials Engineering Research — Credits Arranged
Hours arranged (CN. 61-699-001)

Mathematics

FIRST SESSION

MA 102 Analytic Geometry and Calculus I — 4
Prerequisite: MA 111 or equivalent completed in high school
Credits in both MA 102 and MA 112 are not allowed.

0730-0940	(CN. 54-102-001) (CN. 54-102-002)	Staff
1020-1230	(CN. 54-102-003) (CN. 54-102-004)	Staff

MA 111 Algebra and Trigonometry 4
0730-0940 (CN. 54-111-001) (CN. 54-111-002) Staff
1020-1230 (CN. 54-111-003) (CN. 54-111-004) (CN. 54-111-005) Staff

MA 112 Analytic Geometry and Calculus A 4
Prerequisite: MA 111
Credit in both MA 102 and MA 112 is not allowed.
0730-0940 (CN. 54-112-001) (CN. 54-112-002)
1020-1230 (CN. 54-112-003) (CN. 54-112-004) Staff

MA 114 Topics in Modern Mathematics 3
Prerequisite: MA 111 or equivalent completed in high school
0800-0930 (CN. 54-114-001) (CN. 54-114-002) Staff

MA 115 Introduction to Contemporary Mathematics I 3
Credits in MA 115 is not allowed if student already has credit for MA 102, MA 112, or MA 114.
1140-1310 (CN. 54-115-001) (CN. 54-115-002) Staff

MA 122 Mathematics of Finance and Elementary Statistics 4
Prerequisite: MA 111 or MA 115
1020-1230 (CN. 54-122-001) Staff

MA 201 Analytic Geometry and Calculus II 4
Prerequisite: MA 102
0730-0940 (CN. 54-201-001) (CN. 54-201-002) Staff
1020-1230 (CN. 54-201-003) (CN. 54-201-004) (CN. 54-201-005) Staff

MA 202 Analytic Geometry and Calculus III 4
Prerequisite: MA 201
0730-0940 (CN. 54-202-001) (CN. 54-202-002) Staff
1020-1230 (CN. 54-203-003) (CN. 54-202-004) Staff

MA 231 Introduction to Linear Algebra 4
Prerequisite: MA 201
1020-1230 (CN. 54-231-001) Staff

MA 301 Applied Differential Equations I 3
Prerequisite: MA 202 or equivalent
0800-0930 (CN. 54-301-001) (CN. 54-301-002) Staff
1140-1310 (CN. 54-301-003) (CN. 54-301-004) Staff

MA 401 Applied Differential Equations II 3
Prerequisite: MA 301 or MA 312
0950-1120 (CN. 54-401-001)

MA 405 Introduction to Matrices and Linear Transformations 3
Prerequisite: One year of calculus
0800-0930 (CN. 54-405-001)
1140-1310 (CN. 54-405-002) Staff

MA 421 Introduction to Probability 3
Prerequisite: One year of calculus
1140-1310 (CN. 54-421-001) Staff

MA 425 Mathematical Analysis I 3
Prerequisite: MA 232
0800-0930 (CN. 54-425-001) Staff

MA 511 Advanced Calculus I 3
Prerequisite: MA 301 or MA 312
0800-0930 (CN. 54-511-001) Staff

MA 512 Advanced Calculus II 3
Prerequisite: MA 301 or MA 312
1140-1310 (CN. 54-512-001) Staff

MA 513 Introduction to Complex Variables 3
Prerequisite: MA 425 or MA 511
0800-0930 (CN. 54-513-001)

MA 681 Special Topics in Real Analysis 1-6
Hours arranged (CN. 54-681-001) Staff

MA 683 Special Topics in Algebra 1-6
Hours arranged (CN. 54-683-001) Staff

MA (IE, OR) 692 Special Topics in Mathematical Programming 3
(See operations research, page 60.)

MA 699 Research Credits Arranged
Hours arranged (CN. 54-699-001) Staff

SECOND SESSION

MA 2 Review Algebra 0
0730-0940 (CN. 54-002-001) Staff

MA 102 Analytic Geometry and Calculus I 4
Prerequisite: MA 111 or equivalent completed in high school
Credit in both MA 102 and MA 112 not allowed.
0730-0940 (CN. 54-102-001) Staff
1020-1230 (CN. 54-102-002) (CN. 54-102-003) Staff

MA 111 Algebra and Trigonometry 4
0730-0940 (CN. 54-111-001) (CN. 54-111-002) (CN. 54-111-003) Staff
1020-1230 (CN. 54-111-004) (CN. 54-111-005) (CN. 54-111-006) Staff

MA 112 Analytic Geometry and Calculus A 4
Prerequisite: MA 111
Credits in both MA 102 and MA 112 is not allowed.
1020-1230 (CN. 54-112-001) (CN. 54-112-002) (CN. 54-112-003) Staff

MA 114 Topics in Modern Mathematics 3
Prerequisite: MA 111 or equivalent completed in high school
0800-0930 (CN. 54-114-001) Staff

MA 116 Introduction to Contemporary Mathematics II 3
Prerequisite: MA 115
Credit in MA 116 is not allowed if student already has credit for MA 102, MA 112, or MA 114.
1140-1310 (CN. 54-116-001) (CN. 54-116-002) Staff

MA 201 Analytic Geometry and Calculus II 4
Prerequisite: MA 102
0730-0940 (CN. 54-201-001) (CN. 54-201-002) Staff
1020-1230 (CN. 54-201-003) (CN. 54-201-004) Staff

MA 202 Analytic Geometry and Calculus III 4
Prerequisite: MA 201
0730-0940 (CN. 54-202-001) Staff
1020-1230 (CN. 54-202-002) Staff

MA 212 Analytic Geometry and Calculus B 3
Prerequisite: MA 112
1140-1310 (CN. 54-212-001) (CN. 54-212-002) Staff

MA 232 Introduction to Multivariable Calculus 3
Prerequisite: MA 231
0950-1120 (CN. 54-232-001) Staff

MA 301 Applied Differential Equations I 3
Prerequisite: MA 202 or equivalent
0800-0930 (CN. 54-301-001) (CN. 54-301-002) Staff
1140-1310 (CN. 54-301-003) (CN. 54-301-004) Staff

MA 312 Introduction to Differential Equations 3
Prerequisites: MA 231, MA 201
0800-0930 (CN. 54-312-001) Staff

MA 401 Applied Differential Equations II 3
Prerequisite: MA 301 or MA 312
0950-1120 (CN. 54-401-001) Staff

MA 403 Introduction to Modern Algebra 3
Prerequisite: One year of calculus
0800-0930 (CN. 54-403-001) Staff

MA 405 Introduction to Matrices and Linear Transformations 3
Prerequisite: One year of calculus
1140-1310 (CN. 54-405-001) (CN. 54-405-002) Staff

MA 426 Mathematical Analysis II 3
Prerequisite: MA 425
0800-0930 (CN. 54-426-001) Staff

MA 433 History of Mathematics 3
Prerequisite: One year of calculus
0950-1120 (CN. 54-433-001) Staff

MA 504 Mathematical Methods in Engineering 3
Prerequisite: MA 301 or MA 312
0950-1120 (CN. 54-504-001) Staff

MA (OR, IE) 505 Mathematical Programming I 3
(See operations research, page 60.)

MA 512 Advanced Calculus II 3
Prerequisite: MA 301 or MA 312
0800-0930 (CN. 54-512-001)

MA (ST) 541 Theory of Probability I 3
Prerequisite: MA 425 or MA 511
1140-1310 (CN. 54-541-001) Staff

MA 622 Linear Transformations and Matrix Theory 3
Prerequisite: MA 405
0800-0930 (CN. 54-622-001) Staff

MA 681 Special Topics in Real Analysis 1-6
Hours arranged (CN. 54-681-001) Staff

MA 683 Special Topics in Algebra 1-6
Hours arranged (CN. 54-683-001) Staff

MA (OR, IE) 692 Special Topics in Mathematical Programming 3
(See operations research, page 61.)

MA 699 Research Credits Arranged
Hours arranged (CN. 54-699-001) Staff

Mechanical and Aerospace Engineering

FIRST SESSION

MAE 216 Elements of Mechanical Engineering 3
Prerequisites: ESM 205, PY 208 or PY 202
0800-0930 (CN. 55-216-001) Staff

MAE 250 Introduction to Aerospace Engineering 3
Prerequisite: PY 205
0800-0930 (CN. 55-250-001) Hale

MAE 301 Engineering Thermodynamics I 3
Prerequisites: MA 202, PY 208 or PY 202
0800-0930 (CN. 55-301-001) Moore
0950-1120 (CN. 55-301-002) Knight

MAE 305 Mechanical Engineering Laboratory I 1
Corequisite: MAE 301
1340-1750 T Th (CN. 55-305-001) Batton

MAE 315 Dynamics of Machines 3
Prerequisites: MAE 216, ESM 305
0950-1120 (CN. 55-315-001) Hale

MAE 545 Project Work in Mechanical Engineering I 2
Hours arranged (CN. 55-545-001) Staff

MAE 699 Mechanical Engineering Research Credits Arranged
Prerequisites: Graduate standing in mechanical engineering and approval of adviser
Hours arranged (CN. 55-699-001) Staff

SECOND SESSION

MAE 302 Engineering Thermodynamics II 3
Prerequisite: MAE 301
0950-1120 (CN. 55-302-001) Perkins

MAE 306 Mechanical Engineering Laboratory II 1
Prerequisites: MAE 305 and EE 331
1340-1750 T Th (CN. 55-306-001) Batton

MAE 546 Project Work in Mechanical Engineering II 2
Hours arranged (CN. 55-546-001) Staff

MAE 699 Mechanical Engineering Research Credits Arranged
Prerequisites: Graduate standing in mechanical engineering and approval of adviser
Hours arranged (CN. 55-699-001) Staff

Meteorology

FIRST SESSION

MY 444 Meteorological Laboratory II 4
Prerequisite: MY 443
1020-1230 (CN. 56-444-001) Watson

MY 512 Micrometeorology 3
Prerequisite: MY 422
0800-0930 (CN. 56-512-001) Weber

MY 699 Research — Credits Arranged
Prerequisite: Graduate standing and consent of advisory committee
Hours arranged (CN. 56-699-001)

SECOND SESSION

MY 593 Advanced Topics — 2 or 3
Prerequisite: Consent of staff
0800-0900 Atmospheric Statistics (CN. 56-593-001) — Watson 2
0950-1120 (CN. 56-593-002) — Weber 3

MY 699 Research — Credits Arranged
Prerequisite: Graduate standing and consent of advisory committee
Hours arranged (CN. 56-699-001) — Staff

Microbiology

FIRST SESSION

MB 692 Special Problems in Microbiology — Credits Arranged
Hours arranged (CN. 57-692-001) — Staff

MB 699 Microbiology Research — Credits Arranged
Hours arranged (CN. 57-699-001) — Staff

SECOND SESSION

MB 692 Special Problems in Microbiology — Credits Arranged
Hours arranged (CN. 57-692-001) — Staff

MB 699 Microbiology Research — Credits Arranged
Hours arranged (CN. 57-699-001) — Staff

Music

FIRST SESSION

MUS 200 Understanding Music — 3
0800-0930 (CN. 69-200-001) — Adcock
0950-1120 (CN. 69-200-002) — Ostergren

MUS 210 A Survey of Music in America — 3
0950-1120 (CN. 69-210-001) — Adcock

MUS 215 Music of the 17th and 18th Centuries — 3
0800-0930 (CN. 69-215-001) — Ostergren

SECOND SESSION

MUS 200 Understanding Music — 3
0950-1120 (CN. 69-200-001) — Bliss

MUS 320 Music of the 20th Century — 3
0800-0930 (CN. 69-320-001) — Bliss

Nuclear Engineering

FIRST SESSION

NE 491, 492 Nuclear Engineering Topics I, II — 1-4
Prerequisite: Consent of instructor
Hours arranged (CN. 70-491-001)
Hours arranged (CN. 70-492-001) — Staff

NE 591, 592 Special Topics in Nuclear Engineering I, II 3
Prerequisite: Consent of instructor
Hours arranged (CN. 70-591-001)
Hours arranged (CN. 70-592-001) Staff

NE 691 Advanced Topics in Nuclear Engineering I 3
Prerequisite: Consent of instructor
Hours arranged (CN. 70-691-001) Staff

NE 699 Research in Nuclear Engineering Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 70-699-001) Staff

SECOND SESSION

NE 419 Introduction to Nuclear Engineering 3
Prerequisite: PY 202 or PY 208
0950-1120 (CN. 70-419-001) Stam

NE 491, 492 Nuclear Engineering Topics I, II 1-4
Prerequisite: Consent of instructor
Hours arranged (CN. 70-491-001)
Hours arranged (CN. 70-492-001) Staff

NE 591, 592 Special Topics in Nuclear Engineering I, II 3
Prerequisite: Consent of instructor
Hours arranged (CN. 70-591-001)
Hours arranged (CN. 70-592-001) Staff

NE 699 Research in Nuclear Engineering Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 70-699-001) Staff

Operations Research

FIRST SESSION

OR 501 Introduction to Operations Research 3
Prerequisites: MA 405, MA 421
0950-1120 (CN. 73-501-001) Bernhard

OR 691 Special Topics in Operations Research 3
Prerequisites: OR 501, OR (IE, MA) 505
Hours arranged (CN. 73-691-001)

OR (IE, MA) 692 Special Topics in Mathematical Programming 3
Prerequisites: OR (IE, MA) 505
Hours arranged (CN. 73-692-001) Staff

OR 699 Project in Operations Research 1-3
Prerequisites: Variable
Hours arranged (CN. 73-699-001) Staff

SECOND SESSION

OR (IE, MA) 505 Mathematical Programming I 3
Prerequisite: MA 405
0800-0930 (CN. 73-505-001) McAllister

OR 691 Special Topics in Operations Research 3
Prerequisites: OR 501, OR (IE, MA) 505
Hours arranged (CN. 73-691-001)

OR (IE, MA) 692 Special Topics in Mathematical Programming 3
Prerequisites: OR (IE, MA) 505
Hours arranged (CN. 73-692-001) Staff

OR 699 Project in Operations Research 1-3
Prerequisites: Variable
Hours arranged (CN. 73-699-001) Staff

Philosophy

(Also see Religion.)

FIRST SESSION

PHI 201 Logic 3
0800-0930 (CN. 74-201-001) Nagel

PHI 205 Problems and Types of Philosophy 3
0800-0930 (CN. 74-205-001) Bredenberg
0950-1120 (CN. 74-205-002) VanDeVeer
1140-1310 (CN. 74-205-003) Regan

PHI 306 Philosophy of Art 3
0950-1120 (CN. 74-306-001) Bredenberg

PHI 307 Morality and Human Happiness 3
0950-1120 (CN. 74-307-001) Regan

PHI 309 Contemporary Political Philosophy 3
0800-0930 (CN. 74-309-001) VanDeVeer

PHI 405 Philosophy of Science 3
0950-1120 (CN. 74-405-001) Nagel

SECOND SESSION

PHI 201 Logic 3
0800-0930 (CN. 74-201-001) Metzger

PHI 205 Problems and Types of Philosophy 3
0800-0930 (CN. 74-205-001) Carter
0950-1120 (CN. 74-205-002) Bryan

PHI 300 Early Western Philosophy 3
0950-1120 (CN. 74-300-001) Carter

PHI (ED) 304 Philosophy of Education 3
0800-0930 (CN. 74-304-001) Bryan

PHI 405 Philosophy of Science 3
0950-1120 (CN. 74-405-001) Metzger

Physical Education

FIRST SESSION

PE 112 Beginning Swimming I 1
1200-1300 (CN. 75-112-001) Leonhardt

PE 221 Intermediate Swimming 1
1200-1300 (CN. 75-221-001) Berle
1300-1400 (CN. 75-221-002) Berle

PE 242 Badminton 1
1200-1300 (CN. 75-242-001) Drews

PE 243 Bowling	1
1420-1520 (CN. 75-243-001)	Leonhardt
($20.00 Bowling Alley Fee)	
PE 245 Golf	1
0910-1010 (CN. 75-245-001)	Smaltz
1020-1120 (CN. 75-245-002)	Smaltz
1300-1400 (CN. 75-245-003)	Smaltz
1400-1500 (CN. 75-245-004)	Smaltz
PE 249 Tennis I	1
0910-1010 (CN. 75-249-001)	Drews
1020-1120 (CN. 75-249-002)	Drews
1300-1400 (CN. 75-249-003)	Leonhardt
1400-1500 (CN. 75-249-004)	Berle
1500-1600 (CN. 75-249-005)	Berle
PE 251 Target Archery	1
1020-1120 (CN. 75-251-001)	Combs
1320-1420 (CN. 75-251-002)	Combs
1420-1520 (CN. 75-251-003)	Combs
PE 265 Softball	1
1520-1600 (CN. 75-265-001)	Leonhardt
PE 269 Volleyball	1
1200-1300 (CN. 75-269-001)	Combs

SECOND SESSION

PE 112 Beginning Swimming I	1
1300-1400 (CN. 75-112-001)	Keating
PE 221 Intermediate Swimming	1
1200-1300 (CN. 75-221-001)	Wall
PE 242 Badminton	1
1020-1120 (CN. 75-242-001)	Keating
PE 243 Bowling	1
1420-1520 (CN. 75-243-001)	Cooper
($20.00 Bowling Alley Fee)	
PE 245 Golf	1
0930-1030 (CN. 75-245-001)	Cooper
1030-1130 (CN. 75-245-002)	Cooper
1300-1400 (CN. 75-245-003)	Cooper
PE 249 Tennis I	1
1200-1300 (CN. 75-249-001)	Keating
1320-1420 (CN. 75-249-002)	Wall
1420-1520 (CN. 75-249-003)	Wall
PE 251 Target Archery	1
1020-1120 (CN. 75-251-001)	Cheek
1320-1420 (CN. 75-251-002)	Cheek
1420-1520 (CN. 75-251-003)	Cheek
PE 265 Softball	1
1520-1620 (CN. 75-265-001)	Wall
PE 269 Volleyball	1
1200-1300 (CN. 75-269-001)	Cheek

Physical Oceanography

FIRST SESSION

OY (MAS) 699 Research in Physical Oceanography Credits Arranged
Prerequisite: Graduate standing and consent of advisory committee
Hours arranged (CN. 72-699-001) Staff

SECOND SESSION

OY (MAS) 699 Research in Physical Oceanography Credits Arranged
Prerequisite: Graduate standing and consent of advisory committee
Hours arranged (CN. 72-699-001) Staff

Physics

FIRST SESSION

PY 205 General Physics 4
Prerequisite: MA 102
LR 0800-0930 (CN. 77-205-001)
LB 1250-1500 M W (CN. 77-205-101)
LB 1510-1720 M W (CN. 77-205-102) Staff

PY 208 General Physics 4
Prerequisite: PY 205
LR 0950-1120 (CN. 77-208-001)
LB 1250-1500 M W (CN. 77-208-101)
LB 1510-1750 M W (CN. 77-208-102) Staff

PY 211 General Physics 4
Prerequisite: MA 111 or MA 116
LR 0950-1120 (CN. 77-211-001)
LB 1250-1500 M W (CN. 77-211-101)
LB 1510-1720 M W (CN. 77-211-102) Staff

PY 212 General Physics 4
Prerequisite: PY 211
LR 0800-0930 (CN. 77-212-001)
LB 1250-1500 M W (CN. 77-212-101) Staff

PY 221 College Physics 5
Prerequisite: MA 111 or MA 115
1020-1300 (CN. 77-221-001) Staff

PY 223 Astronomy 3
LR 0910-1010 (CN. 77-223-001)
LB Hours arranged (CN. 77-223-101) Jenkins

PY 231 Physics for Non-Scientists 3
For Liberal Arts students only.
0800-0930 (CN. 77-231-001) Staff

PY 499 Special Problems in Physics 1-3
Prerequisite: Consent of department
Hours arranged (CN. 77-499-001) Staff

PY 599 Senior Research 3
Prerequisites: Senior honors program standing, except with special permission
Hours arranged (CN. 77-599-001) Staff

PY 695 Seminar 1
1300-1430 M W (CN. 77-695-001) Staff

PY 699 Research — Credits Arranged
Hours arranged (CN. 77-699-001) — Staff

SECOND SESSION

PY 205 General Physics — 4
Prerequisite: MA 102
LR 0800-0930 M W (CN. 77-205-001)
LB 1250-1500 M W (CN. 77-205-101)
LB 1510-1720 M W (CN. 77-205-102) — Staff

PY 208 General Physics — 4
Prerequisite: PY 205
LR 0950-1120 (CN. 77-208-001)
LB 1250-1500 M W (CN. 77-208-101)
LB 1510-1720 M W (CN. 77-208-102)
LB 1250-1500 T Th (CN. 77-208-103) — Staff

PY 211 General Physics — 4
Prerequisite: MA 111 or MA 116
LR 0950-1120 (CN. 77-211-001)
LB 1250-1500 M W (CN. 77-211-101)
LB 1510-1720 M W (CN. 77-211-102) — Staff

PY 212 General Physics — 4
Prerequisite: PY 211
LR 0800-0930 (CN. 77-212-001)
LR 0950-1120 (CN. 77-212-002)
LB 1250-1500 M W (CN. 77-212-101)
LB 1510-1720 M W (CN. 77-212-102)
LB 1250-1500 T Th (CN. 77-212-103) — Staff

PY 245 Physical Principles of Photography — 3
Prerequisites: PY 203, 208, 212, 221, 231 and CH 101 or CH 111
LR 1020-1120 (CN. 77-245-001)
LB 1340-1620 M W (CN. 77-245-101) — Cobb

PY 407 Introduction to Modern Physics — 3
Prerequisites: PY 208, MA 202
0800-0930 (CN. 77-407-001) — Staff

PY 499 Special Problems in Physics — 1-3
Prerequisite: Consent of department
Hours arranged (CN. 77-499-001) — Staff

PY 599 Senior Research — 3
Prerequisite: Senior honors program standing, except with special permission
Hours arranged (CN. 77-599-001) — Staff

PY 695 Seminar — 1
1300-1430 M W (CN. 77-695-001) — Staff

PY 699 Research — Credits Arranged
Hours arranged (CN. 77-699-001) — Staff

Plant Pathology

FIRST SESSION

PP 595 Special Problems in Plant Pathology — Credits Arranged
Prerequisite: Consent of instructor — Maximum 6
Hours arranged (CN. 79-595-001) — Staff

PP 699 Research in Plant Pathology — Credits Arranged
Prerequisite: Graduate standing and consent of instructor
Hours arranged (CN. 79-699-001) — Staff

SECOND SESSION

PP 595 Special Problems in Plant Pathology — Credits Arranged
Prerequisite: Consent of instructor — Maximum 6
Hours arranged (CN. 79-595-001) — Staff

PP 699 Research in Plant Pathology — Credits Arranged
Prerequisite: Graduate standing and consent of instructor
Hours arranged (CN. 79-699-001) — Staff

Politics

FIRST SESSION

PS 201 American Governmental System — 3
0800-0930 (CN. 80-201-001) — Gilbert
1140-1310 (CN. 80-201-002) — Kebschull

PS 202 Introduction to Politics — 3
0950-1120 (CN. 80-202-001) — Kebschull

PS 206 Local Governmental Systems — 3
0800-0930 (CN. 80-206-001) — McClain

PS 222 Introduction to Global Politics — 3
1140-1310 (CN. 80-222-001) — Soroos

PS 313 Women and Public Policy — 3
1140-1310 (CN. 80-313-001) — Stewart

PS 321 U.S. Foreign Policy — 3
0950-1120 (CN. 80-321-001) — Gilbert

PS 336 Global Environmental Policy — 3
0950-1120 (CN. 80-336-001) — Soroos

PS 506 Public Personnel Administration — 3
Prerequisite: PS 502 or consent of instructor
0950-1120 (CN. 80-506-001) — Stewart

PS 516 Public Policy Analysis — 3
Prerequisite: Graduate standing; advanced undergraduate standing and consent of instructor
0800-0930 (CN. 80-516-001) — Williams

SECOND SESSION

PS 201 American Governmental System — 3
0800-0930 (CN. 80-201-001) — Mastro
0950-1120 (CN. 80-201-002) — Holtzman
1140-1310 (CN. 80-201-003) — Hurwitz

PS 206 Local Governmental Systems — 3
1140-1310 (CN. 80-206-001) — Rassel

PS 401 American Parties and Pressure Groups — 3
0800-0930 (CN. 80-401-001) — Holtzman

PS 472 Soviet Politics — 3
0950-1120 (CN. 80-472-001) — Mastro

PS 507 Collective Negotiations in the Public Service 3
Prerequisite: PS 201 or consent of instructor
0950-1120 (CN. 80-507-001) Ellis

PS 616 Seminar in Program Evaluation 3
Prerequisite: PS 516 or consent of instructor
0800-0930 (CN. 80-616-001) Rassel

Poultry Science

FIRST SESSION

PO 495 Special Problems in Poultry Science Maximum 6
Prerequisite: Junior standing and consent of instructor
Hours arranged (CN. 81-495-001) Prince

PO 698 Special Problems in Polutry Science Maximum 6
Prerequisite: Graduate standing
Hours arranged (CN. 81-698-001) Hill

PO 699 Poultry Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 81-699-001) Hill

SECOND SESSION

PO 495 Special Problems in Poultry Science Maximum 6
Prerequisite: Junior standing and consent of instructor
Hours arranged (CN. 81-495-001) Prince

PO 698 Special Problems in Poultry Science Maximum 6
Prerequisite: Graduate standing
Hours arranged (CN. 81-698-001) Hill

PO 699 Poultry Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 81-699-001) Hill

Psychology

FIRST SESSION

PSY 200 Introduction to Psychology 3
0800-0930 (CN. 83-200-001) Staff
0950-1120 (CN. 83-200-002) Staff

PSY 210 Psychological Analysis Applied to Current Problems 3
Prerequisite: PSY 200
0800-0930 (CN. 83-210-001) Smith

PSY 300 Perception 3
Prerequisites: PSY 200, introductory biological sciences, physics or chemistry recommended
0950-1120 (CN. 83-300-001) Mershon

PSY 304 Educational Psychology 3
0800-0930 (CN. 83-304-001) Miller

PSY 310 Learning and Motivation 3
Prerequisite: PSY 200
1140-1310 (CN. 83-310-001) Cole

PSY 337 Psychology, Industrial Society and Social Policy 3
Prerequisite: PSY 200
0950-1120 (CN. 83-337-001) Cunningham

PSY 504 Advanced Educational Psychology 3
Prerequisite: Six hours in psychology
0800-0930 (CN. 83-504-001) Miller

***PSY 520 Cognitive Processes** 3
Prerequisite: Graduate standing
1140-1410 (CN. 83-520-001) Corter
*Course to be offered for special group of students.

PSY 530 Abnormal Psychology 3
Prerequisites: PSY 200, PSY 302
0950-1140 (CN. 83-530-001) Corter

PSY 599 Research Problems in Psychology Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 83-599-001) Staff

PSY 693 Psychological Clinic Practicum Maximum 12
Prerequisite: Nine hours in psychology
Hours arranged (CN. 83-693-001) Staff

PSY 699 Thesis and Dissertation Research Credits Arranged
Prerequisite: Graduate standing and consent of instructor
Hours arranged (CN. 83-699-001) Staff

SECOND SESSION

PSY 200 Introduction to Psychology 3
0800-0930 (CN. 83-200-001) Staff
0950-1120 (CN. 83-200-002) Staff

PSY 304 Educational Psychology 3
0950-1120 (CN. 83-304-001) Johnson

PSY 320 Cognitive Processes 3
Prerequisite: PSY 200
0800-0930 (CN. 83-320-001) Cole

PSY 337 Psychology, Industrial Society and Social Policy 3
Prerequisite: PSY 200
1140-1310 (CN. 83-337-001) Cunningham

PSY 411 Social Psychology 3
Prerequisite: PSY 200
0800-0930 (CN. 83-411-001) Graduate Student

PSY 491 Seminar in Psychology 3
Prerequisites: Senior standing, consent of department
1140-1310 (CN. 83-491-001) Staff

PSY 492 Seminar in Psychology 3
Prerequisites: Senior standing, consent of department
1140-1310 (CN. 83-492-001) Staff

PSY 504 Advanced Educational Psychology 3
Prerequisite: Six hours in psychology
0950-1120 (CN. 83-504-001) Johnson

PSY (ED) 531 Mental Deficiency 3
(See education, page 40.)

PSY 535 Tests and Measurements 3
Prerequisite: Six hours in psychology
0800-0930 (CN. 83-535-001) Westbrook
1140-1310 (CN. 83-535-002) Westbrook

PSY 576 Developmental Psychology 3
Prerequisites: Nine hours in psychology, including PSY 475 or PSY 476
1140-1310 (CN. 83-576-001) Rawls

PSY 599 Research Problems in Psychology Credits Arranged
Prerequisite: Consent of instructor
Hours arranged (CN. 83-599-001) Staff

PSY 691 Special Topics in Psychology: Cognitive Processes for Visually Impaired 1-3
Prerequisite: Graduate standing and permission of instructor
Hours arranged (CN. 83-691-001) Staff

PSY 699 Thesis and Dissertation Research Credits Arranged
Prerequisite: Graduate standing and permission of instructor
Hours arranged (CN. 83-699-001) Staff

Recreation Resources Administration

FIRST SESSION

RRA 152 Introduction to Recreation 3
0900-1045 (CN. 85-152-001) Sternloff

RRA 215 Maintenance and Operation I 3
Prerequisite: RRA 152
0730-0845 (CN. 85-215-001) Warren

RRA 216 Maintenance and Operation II 3
Prerequisite: RRA 152
0900-1045 (CN. 85-216-001) Warren

RRA 359 Recreation and Park Supervision 3
Prerequisite: RRA 358
1100-1245 (CN. 85-359-001) Sternloff

RRA 475 Recreation and Park Internship 9
Prerequisite: Senior status, RRA 359
Hours arranged (CN. 85-475-001) Smith, McKnelly, Wilson

RRA 591 Recreation Resources Problems Credits Arranged
Prerequisite: Advanced undergraduate or graduate status
Hours arranged (CN. 85-591-001) Staff

RRA 692 Advanced Problems in Recreation Credits Arranged
Prerequisite: Twelve hours of RRA courses
Hours arranged (CN. 85-692-001) Staff

RRA 699 Research in Recreation Credits Arranged
Prerequisite: Twelve hours of RRA courses
Hours arranged (CN. 85-699-001) Staff

SECOND SESSION

RRA 152 Introduction to Recreation 3
0900-1045 (CN. 85-152-001) Miller
1100-1245 (CN. 85-152-002) Miller

RRA 591 Recreation Resources Problems — Credits Arranged
Prerequisite: Advanced undergraduate or graduate status
Hours arranged (CN. 85-591-001) — Staff

RRA 692 Advanced Problems in Recreation — Credits Arranged
Prerequisite: Twelve hours of RRA courses
Hours arranged (CN. 85-692-001) — Staff

RRA 699 Research in Recreation — Credits Arranged
Prerequisite: Twelve hours of RRA courses
Hours arranged (CN. 85-699-001) — Staff

Religion

(Also see Philosophy.)

FIRST SESSION

REL 300 Introduction to Religion — 3
0800-0930 (CN. 87-300-001) — Highfill
0950-1120 (CN. 87-300-002) — Highfill

SECOND SESSION

REL 300 Introduction to Religion — 3
0800-0930 (CN. 87-300-001) — Middleton
0950-1120 (CN. 87-300-002) — Middleton

Social Work

FIRST SESSION

SW 203 Social Welfare in the United States — 3
0950-1120 (CN. 86-203-001) — Gilmore

SW 205 Social Welfare Policies and Issues — 3
Prerequisite: SW 203
0800-0930 (CN. 86-205-001) — Russell

SW 307 Social Welfare Programs and Delivery Systems — 3
Prerequisite: SW 205 or consent of instructor
1140-1310 (CN. 86-307-001) — Gilmore

SW 406 Field Work I — 6
Prerequisite: SW 405
Hours Arranged (CN. 86-406-001) — Adkins

SECOND SESSION

SW 407 Field Work II — 6
Prerequisite: SW 406
Hours arranged (CN. 86-407-001) — Adkins

Sociology

FIRST SESSION

SOC 202 Principles of Sociology — 3
0800-0930 (CN. 92-202-001) — Staff
0950-1120 (CN. 92-202-002) — Wimberley
0950-1120 (CN. 92-202-003) — Mustian
1140-1310 (CN. 92-202-004) — Uzzell
1200-1330 (CN. 92-202-005) — Wimberley

SOC 301 Human Behavior 3
0800-0930 (CN. 92-301-001) Drabick
0950-1120 (CN. 92-301-002) Drabick
1140-1310 (CN. 92-301-003) Staff

SOC 303 Current Social Problems 3
1140-1310 (CN. 92-303-001) Mustian

SOC 304 Contemporary Family Life 3
0800-0930 (CN. 92-304-001) Uzzell
0950-1120 (CN. 92-304-002) Tobin
1140-1310 (CN. 92-304-003) Tobin

SOC 306 Criminology 3
0800-0930 (CN. 92-306-001) Steffensmeier
0950-1120 (CN. 92-306-002) Steffensmeier

SOC 411 Community Relationships 3
Prerequisite: SOC 202
0800-0930 (CN. 92-411-001) Brisson
0950-1120 (CN. 92-411-002) Brisson

SOC 451 Population and Public Affairs 3
Prerequisite: SOC 202 or equivalent
0950-1120 (CN. 92-451-001) Staff

SOC 498 Special Topics in Sociology 1-6
Prerequisite: Six hours sociology above the freshman level
Hours arranged (CN. 92-498-001) Mayo

SOC (ED) 501 Leadership 3
Prerequisite: SOC 202 or equivalent
0950-1120 (CN. 92-501-001) Young

SOC 502 Society, Culture and Personality 3
Prerequisite: SOC 202 or equivalent
0800-0930 (CN. 92-502-001) Rawls
1140-1310 (CN. 92-502-002) Rawls

SOC 503 Contemporary Sociology 3
Prerequisite: Graduate standing
0950-1120 (CN. 92-503-001) Kim

SOC 541 Social Systems and Planned Change 3
Prerequisite: Three hours sociology
0800-0930 (CN. 92-541-001) Kim

SOC 591 Special Topics in Sociology 1-6
Prerequisite: Consent of instructor
Hours arranged (CN. 92-591-001) Mayo

SOC 699 Research in Sociology Credits Arranged
Prerequisite: Consent of chairman of graduate study committee
Hours arranged (CN. 92-699-001) Mayo

SECOND SESSION

SOC 202 Principles of Sociology 3
0730-0900 (CN. 92-202-001) Dawson
0800-0930 (CN. 92-202-002) Faulkner
0950-1120 (CN. 92-202-003) Dawson
1140-1310 (CN. 92-202-004) Staff

SOC 301 Human Behavior 3
0800-0930 (CN. 92-301-001) Hyman
0950-1120 (CN. 92-301-002) Hyman
1140-1310 (CN. 92-301-003) Staff

SOC 303 Current Social Problems 3
0950-1120 (CN. 92-303-001) Faulkner

SOC 304 Contemporary Family Life 3
0800-0930 (CN. 92-304-001) Staff
0950-1120 (CN. 92-304-002) Staff
1140-1310 (CN. 92-304-003) Mercer

SOC 305 Race Relations 3
0950-1120 (CN. 92-305-001) Shurling
1140-1310 (CN. 92-305-002) Shurling

SOC 306 Criminology 3
0950-1120 (CN. 92-306-001) Suval
1140-1310 (CN. 92-306-002) Suval

SOC 498 Special Topics in Sociology 1-6
Prerequisite: Six hours sociology above the freshman level
Hours arranged (CN. 92-498-001) Mayo

SOC 503 Contemporary Sociology 3
Prerequisite: Graduate standing
1140-1310 (CN. 92-503-001) Marsh

SOC 512 Family Analysis 3
Prerequisite: SOC 202 or equivalent
0950-1120 (CN. 92-512-001) Mercer

SOC 541 Social Systems and Planned Change 3
Prerequisite: Three hours sociology
0800-0930 (CN. 92-541-001) Marsh

SOC 591 Special Topics in Sociology 1-6
Prerequisite: Consent of instructor
Hours arranged (CN. 92-591-001) Mayo

SOC 699 Research in Sociology Credits Arranged
Prerequisite: Consent of chairman of graduate study committee
Hours arranged (CN. 92-699-001) Mayo

Soil Science

FIRST SESSION

SSC 560 Advanced Soil Management 3
Prerequisites: SSC 200, SSC 341
Special three-week session (June 9-June 27)
LR 0950-1120 (CN. 93-560-001) Staff
LB 1340-1510 (CN. 93-560-101)

SSC 590 Special Problems Credits Arranged
Prerequisite: SSC 200
Hours arranged (CN. 93-590-001) Graduate Staff

SSC 699 Research Credits Arranged
Prerequisite: Graduate standing in soil science
Hours arranged (CN. 93-699-001) Graduate Staff

SECOND SESSION

SSC 590 Special Problems — Credits Arranged
Prerequisite: SSC 200
Hours arranged (CN. 93-590-001) — Graduate Staff

SSC 699 Research — Credits Arranged
Prerequisite: Graduate standing in soil science
Hours arranged (CN. 93-699-001) — Graduate Staff

Speech

FIRST SESSION

SP 210 Voice and Articulation — 3
1140-1310 (CN. 37-210-001) — Staff

SP 231 Expository Speaking — 3
0800-0930 (CN. 37-231-001) — Staff
0950-1120 (CN. 37-231-002) — Staff
1140-1310 (CN. 37-231-003) — Staff

SP 238 Interpersonal Communication — 3
1140-1310 (CN. 37-238-001) — Franklin

***SP 450 Fundamentals of Television Production** — 3
LR 0950-1120 (CN. 37-450-001) — Malcolm
LB 1140-1310 (CN. 37-450-101) — Malcolm
*Course runs from May 21 to June 13

SECOND SESSION

SP 231 Expository Speaking — 3
0800-0930 (CN. 37-231-001) — Staff
0950-1120 (CN. 37-231-002) — Staff

SP 237 Group Discussion — 3
0950-1120 (CN. 37-237-001) — Munn

SP 238 Interpersonal Communication — 3
0800-0930 (CN. 37-238-001) — Munn

SP 336 Parliamentary Practice — 3
1140-1310 (CN. 37-336-001) — Camp

Statistics

FIRST SESSION

ST 311 Introduction to Statistics — 3
0950-1120 (CN. 94-311-001) — Staff

ST 361 Introduction to Statistics for Engineers — 3
Prerequisite: College algebra
0800-0930 (CN. 94-361-001) — Staff

ST 511-S Experimental Statistics I — 3
Prerequisite: ST 311 or graduate standing
0800-0930 (CN. 94-511-001) — Staff

ST 591 Special Problems — 1-3
Hours arranged (CN. 94-591-001) — Staff

ST 691 Advanced Special Problems 1-3
Prerequisites: ST 502 or equivalent, ST 552
Hours arranged (CN. 94-691-001) Staff

ST 699 Research Credits Arranged
Hours arranged (CN. 94-699-001) Staff

SECOND SESSION

ST 512-S Experimental Statistics II 3
Prerequisite: ST 511 or equivalent
0800-0930 (CN. 94-512-001) Staff

ST (MA) 541 Theory of Probability I 3
(See mathematics, page 57.)

ST 591 Special Problems 1-3
Hours arranged (CN. 94-591-001) Staff

ST 691 Advanced Special Problems 1-3
Prerequisites: ST 502 or equivalent, ST 552
Hours arranged (CN. 94-691-001) Staff

ST 699 Research Credits Arranged
Hours arranged (CN. 94-699-001) Staff

Textile Chemistry

FIRST SESSION

T 203 Fiber Science I 3
Prerequisite: CH 101
0950-1120 (CN. 95-203-001) Staff

TC 490 Special Topics in Textile Chemistry Credits Arranged
Hours arranged (CN. 96-490-001) Staff

TC 699 Textile Research for Textile Chemistry Credits Arranged
Hours arranged (CN. 96-699-001) Staff

SECOND SESSION

T 301 Technology of Dyeing and Finishing 4
Prerequisite: T 203
LR 0800-0930 (CN. 95-301-001) Staff
LB 1340-1620 (CN. 95-301-101)

TC 490 Special Topics in Textile Chemistry Credits Arranged
Hours arranged (CN. 96-490-001) Staff

TC 699 Textile Research for Textile Chemistry Credits Arranged
Hours arranged (CN. 96-699-001) Staff

Textile Technology

FIRST SESSION

T 220 Yarn Forming Systems 4
Prerequisite: T 101 or equivalent
LR 0800-0930 (CN. 95-220-001)
LB 1340-1620 T Th (CN. 95-220-101) Pardue

TX 330 Textile Measurements and Quality Control 4
Prerequisites: T 250, ST 361
LR 0950-1120 (CN. 97-330-001)
LB 1340-1620 M W (CN. 97-330-101) Stuckey

TX 350 Woven Fabric Structures 5
Prerequisites: T 250, TX 211
LR 1020-1230 (CN. 97-350-001)
LB 1340-1620 T Th (CN. 97-350-101) Moser

TX 380 Managment and Control of Textile Systems 3
Prerequisites: EC 201, T 250
0800-0930 (CN. 97-380-001) Cooper

TX 490 Development Project in Textile Technology 2-3
Prerequisites: Senior standing, consent of instructor
Hours arranged (CN. 97-490-001) Staff

TX 590 Special Projects in Textiles 2-3
Prerequisites: Senior or graduate standing, consent of instructor
Hours arranged (CN. 97-590-001) Staff

TX 699 Textile Research Credits Arranged
Hours arranged (CN. 97-699-001) Staff

SECOND SESSION

T 250 Fabric Forming Systems 4
Prerequisite: T 101 or equivalent
LR 0950-1120 (CN. 95-250-001)
LB 1340-1620 M W (CN. 95-250-101) Porter

TX 211 Fiber Science II 3
Prerequisites: MA 112 or MA 102
LR 0800-0900 (CN. 97-211-001)
LB 1340-1620 T Th (CN. 97-211-101) Hutchison

TX 340 Principles of Knitted Fabric Structures 5
Prerequisites: T 250, TX 211
LR 1020-1230 (CN. 97-340-001)
LB 1340-1620 M W (CN. 97-340-101) Middleton

TX 490 Development Project in Textile Technology 2-3
Prerequisites: Senior standing, consent of instructor
Hours arranged (CN. 97-490-001) Staff

TX 590 Special Projects in Textiles 2-3
Prerequisites: Senior or graduate standing, consent of instructor
Hours arranged (CN. 97-590-001) Staff

TX 699 Textile Research Credits Arranged
Hours arranged (CN. 97-699-001) Staff

University Studies

FIRST SESSION

UNI 301 Science and Civilization 3
Prerequisite: Sophomore standing
0800-0930 (CN. 89-301-001) Stalnaker

UNI 302 Contemporary Science and Human Values 3
Prerequisite: Sophomore standing
0950-1120 (CN. 89-302-001) Stalnaker

SECOND SESSION

UNI 301 Science and Civilization 3
Prerequisite: Sophomore standing
0800-0930 (CN. 89-301-001) Hoffman

UNI 302 Contemporary Science and Human Values 3
Prerequisite: Sophomore standing
0950-1120 (CN. 89-302-001) Hoffman

Wood and Paper Science

FIRST SESSION

WPS 205 Wood Products Practicum 5
WST summer practicum
Prerequisite: WPS 201 or WPS 202
0800-1700 (CN. 90-205-001) Carter, Gilmore

WPS 210 Forest Products Internship 1
Prerequisite: Completion of summer practicum
0800-1700 (CN. 90-210-001) Carter

WPS 491 Senior Problems in Wood and Paper Science Credits Arranged
Prerequisite: Consent of department
Hours arranged (CN. 90-491-001) Staff

WPS 591 Wood and Paper Science Problems Credits Arranged
Prerequisite: Advanced undergraduate standing
Hours arranged (CN. 90-591-001) Staff

WPS 693 Advanced Wood Technology Problems Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 90-693-001) Staff

WPS 699 Problems in Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 90-699-001) Staff

SECOND SESSION

WPS 491 Senior Problems in Wood and Paper Science Credits Arranged
Prerequisite: Consent of department
Hours arranged (CN. 90-491-001) Staff

WPS 591 Wood and Paper Science Problems Credits Arranged
Prerequisite: Advanced undergraduate standing
Hours arranged (CN. 90-591-001) Staff

WPS 693 Advanced Wood Technology Problems Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 90-693-001) Staff

WPS 699 Problems in Research Credits Arranged
Prerequisite: Graduate standing
Hours arranged (CN. 90-699-001) Staff

Zoology

FIRST SESSION

BS 100 General Biology 4
(See biological sciences, page 27.)

ZO 201 General Zoology 4
Prerequisite: BS 100 or BS 105
LR 0800-0930 (CN. 99-201-001) Staff
LB 1340-1750 M W (CN. 99-201-101) Staff
LB 1340-1750 T Th (CN. 99-201-102) Staff

ZO 203 Vertebrate Zoology 4
Prerequisite: BS 100 or BO 200
LR 1140-1310 (CN. 99-203-001) Staff
LB 1340-1750 M W (CN. 99-203-101) Staff
LB 1340-1750 T Th (CN. 99-203-102) Staff

ZO (BO) 360 Introduction to Ecology 4
Prerequisite: A 200-level biology course
LR 0800-0930 (CN. 99-360-001) Staff
LB 1340-1750 M W (CN. 99-360-101) Staff
LB 1340-1750 T Th (CN. 99-360-102) Staff

ZO 590 Special Studies Credits Arranged
Prerequisites: Twelve hours in zoology, consent of instructor
Hours arranged (CN. 99-590-001) Davis

ZO 592 Topical Problems 1-3
Prerequisite: Consent of instructor
Hours arranged (CN. 99-592-001) Davis

ZO 699 Research in Zoology Credits Arranged
Prerequisites: Twelve hours in zoology, consent of instructor
Hours arranged (CN. 99-699-001) Davis

SECOND SESSION

ZO 221 Conservation of Natural Resources 3
Prerequisite: BS 100
0800-0930 (CN. 99-221-001) Staff

ZO 353 Wildlife Management 3
Prerequisite: BS 100
1140-1310 (CN. 99-353-001) Staff

ZO 590 Special Studies Credits Arranged
Prerequisites: Twelve hours in zoology, consent of instructor
Hours arranged (CN. 99-590-001) Davis

ZO 592 Topical Problems 1-3
Prerequisite: Consent of instructor
Hours arranged (CN. 99-592-001) Davis

ZO 699 Research in Zoology Credits Arranged
Prerequisites: Twelve hours in zoology, consent of instructor
Hours arranged (CN. 99-699-001) Davis

SUMMER SESSIONS FACULTY

A

Daniel Morton Adams, Jr., Ph.D., Assistant Professor of Food Science
Donald Brant Adcock, M.A., Assistant Director of Music
Helen Lynn Adkins, M.A., Visiting Assistant Professor of Sociology and Anthropology and Field Work Supervisor
Fred J. Allred, Ph.D., Associate Professor of Foreign Languages
Michael Amein, Ph.D., Professor of Civil Engineering
Charles Eugene Anderson, Ph.D., Associate Professor of Botany
Charles Noel Anderson, M.E., Assistant Professor of Mathematics
Frank Bradley Armstrong, Ph.D., University Professor of Biochemistry, Genetics, and Microbiology
Thomas Lee Attaway, M.S., Instructor in English
Leonard William Aurand, Ph.D., Professor of Biochemistry and Food Science
Charles Wilson Averre, III, Ph.D., Extension Associate Professor of Plant Pathology
Robert Aycock, Ph.D., Professor of Plant Pathology and Horticultural Science and Head of Department of Plant Pathology

B

Willard Farrington Babcock, S.M., Professor of Civil Engineering
Glenn Earl Baker, Ed.D., Associate Professor of Education
David Stafford Ball, Ph.D., Associate Professor of Economics
Hershell Ray Ball, Jr., Ph.D., Associate Professor of Food Science
William John Barclay, Ph.D., Professor of Electrical Engineering
Kenneth Reece Barker, Ph.D., Professor of Plant Pathology
Gerald William Barrax, M.A., Special Lecturer in English
George Oates Batton, B.S., Instructor in Mechanical Engineering and Administrative Assistant
H. Jan Beaujon, M.S., Instructor in Computer Science
William Howard Beezley, Ph.D., Associate Professor of History
Thomas Alexander Bell, M.S., Professor (USDA) of Food Science
Louis Bender, Ph.D., Visiting Professor of Adult and Community College Education
David Michael Benson, Ph.D., Assistant Professor of Plant Pathology
Henry Albert Bent, Ph.D., Professor of Chemistry
Andrea Lynn Berle, M.Ed., Instructor in Physical Education
Richard Harold Bernhard, Ph.D., Associate Professor of Industrial Engineering
Leonidas Judd Betts, Jr., Ed.D., Associate Professor of Education and English
Marvin Kenneth Beute, Ph.D., Associate Professor of Plant Pathology
William Louis Bingham, Ph.D., Associate Professor of Engineering Science and Mechanics
Ronald Edward Bird, Ph.D., Visiting Assistant Professor of Economics
John William Bishir, Ph.D., Professor of Mathematics
Philip Everett Blank, Jr., Ph.D., Associate Professor of English
George Hansson Blessis, M.E., Associate Professor of Civil Engineering

Milton Clay Bliss, M.A., Assistant Director of Music
Udo Blum, Ph.D., Associate Professor of Botany
Thomas Nelson Blumer, Ph.D., Professor of Food Science
Jon Bordner, Ph.D., Associate Professor of Chemistry and Biochemistry
Henry Dittimus Bowen, Ph.D., Professor of Agricultural Engineering
Lawrence Hoffman Bowen, Ph.D., Professor of Chemistry
Dorothy Lambeck Brant, M.A., Instructor in Mathematics
Paul Arnold Bredenberg, Ph.D., Professor of Philosophy
Robert Curtis Brisson, Ph.D., Associate Professor of Sociology and Anthropology
William Ward Brooks, A.B., Instructor in Economics
Minnie M. Brown, M.S., Extension Associate Professor of Adult and Community College Education and State Leader in Home Economics in the Agricultural Extension Service
Robert Sedgwick Bryan, Ph.D., Professor of Philosophy and Head of Department of Philosophy and Religion
Charles Douglas Bryant, Ed.D., Associate Professor of Agricultural Education
Carl Lee Bumgardner, Ph.D., Professor of Chemistry and Head of Department of Chemistry
Ernest Edmund Burniston, Ph.D., Professor of Mathematics

C

Leon Raymond Camp, Ph.D., Associate Professor of English
Stephen La Vern Campbell, Ph.D., Assistant Professor of Mathematics
Halbert Hart Carmichael, Ph.D., Associate Professor of Chemistry
Daniel Edward Carroll, Jr., Ph.D., Associate Professor of Food Science
Robert James Carson, III, Ph.D., Associate Professor of Geology
Roy Merwin Carter, M.S., Professor of Wood and Paper Science
William Randolph Carter, Ph.D., Assistant Professor of Philosophy
Thomas Courtney Caves, Ph.D., Associate Professor of Chemistry
Richard Edward Chandler, Ph.D., Professor of Mathematics and Graduate Administrator of Mathematics
Harvey Johnson Charlton, Ph.D., Assistant Professor of Mathematics
William Anderson Cheek, M.S., Instructor in Physical Education
John Allen Christian, M.S., Extension Professor and Extension Administrative Coordinator in Food Science
Kwong Tuzz Chung, Ph.D., Associate Professor of Physics
Carlyle Newton Clayton, Ph.D., Professor of Plant Pathology
Maurice Hill Clayton, Ph.D., Associate Professor of Engineering Science and Mechanics
Grover Cleveland Cobb, Jr., Ph.D., Associate Professor of Physics
Harold D. Coble, Ph.D., Extension Associate Professor of Crop Science
James Lawrence Cole, Ph.D., Associate Professor of Psychology
Russell Carr Combs, M.S., Instructor in Physical Education
Charles Joseph Constantin, Ph.D., Assistant Professor of History
Henry Charles Cooke, M.S., Associate Professor of Mathematics
Nelvin Eugene Cooper, M.A., Assistant Professor of Physical Education
William Douglas Cooper, Ph.D., Associate Professor of Textile Technology and Economics
Alonzo Freeman Coots, Ph.D., Associate Professor of Chemistry
Harold Maxwell Corter, Ph.D., Professor of Psychology
Ellis Brevier Cowling, Ph.D., Professor of Plant Pathology, Wood and Paper Science, and Forestry
Walter L. Cox, Jr., Ed.D., Assistant Professor of Education
Paul Day Cribbins, Ph.D., Professor of Civil Engineering
James Ernest Crisp, M.Phil., Instructor in History
Henry Leland Crouch, Jr., M.A.T., Instructor in Mathematics
Johnny Lee Crow, M.S., Instructor in Engineering Graphics

Joseph William Cunningham, Ph.D., Associate Professor of Psychology
Robert Raymond Currie, M.S., Visiting Instructor in Botany
Frederick Francis Czupryna, M.A., Instructor in History

D

John Michael Anthony Danby, Ph.D., Professor of Mathematics and Physics
Edmund Pendleton Dandridge, Jr., Ph.D., Associate Professor of English
Stylianos D. Danielopoulos, Ph.D., Assistant Professor of Computer Science
Fred Darnley, M.S., Visiting Professor of Adult and Community College Education
Charles Bingham Davey, Ph.D., Professor of Soil Science, Forestry and Plant Pathology and Head of the Department of Forestry
William Robert Davis, Ph.D., Professor of Physics
Harold Leroy Davison, M.A.T., Instructor in Mathematics
Cleburn Gilchrist Dawson, Ph.D., Assistant Professor of Sociology and Anthropology
Donald Lee Dean, Ph.D., Professor of Civil Engineering and Head of the Department of Civil Engineering
M. Keith DeArmond, Ph.D., Associate Professor of Chemistry
Selma de la Queriere, M.A., Instructor in Foreign Languages
Walter Jerome Dobrogosz, Ph.D., Professor of Microbiology
Wesley Osborne Doggett, Ph.D., Professor of Physics
William Grady Dotson, Jr., Ph.D., Associate Professor of Mathematics
Lawrence William Drabick, Ph.D., Professor of Sociology and Anthropology
Frederick Richard Drews, Pe.D., Professor of Physical Education and Head of the Department of Physical Education
John Warren Duffield, Ph.D., Professor of Genetics and Forestry
Harry Ernest Duncan, Ph.D., Extension Associate Professor, In Charge, Plant Pathology Extension
Jack Davis Durant, Ph.D., Associate Professor of English

E

John Bynum Easley, M.A., Associate Professor of English
William Taylor Easter, M.S., Associate Professor of Electrical Engineering and Director of Engineering Operations
Eddie Echandi, Ph.D., Professor of Piant Pathology
John Auert Edwards, Ph.D., Professor of Engineering Science and Mechanics
Magdi Mohamed El-Kammash, Ph.D., Associate Professor of Economics
Gerald Hugh Elkan, Ph.D., Professor of Microbiology
Robert Neal Elliott, Jr., Ph.D., Associate Professor of History
Don Edwin Ellis, Ph.D., Professor Emeritus of Plant Pathology
Walter Glenn Ellis, Ph.D., Associate Professor of Politics
John Frederick Ely, Ph.D., Professor of Civil Engineering
John Lincoln Etchells, Ph.D., Professor (USDA) of Food Science and Microbiology
James Brainerd Evans, Ph.D., Professor of Microbiology and Head of the Department of Microbiology

F

Abdel Aziz Fahmy, Ph.D., Professor of Materials Engineering
Maurice Hugh Farrier, Ph.D., Professor of Entomology and Forestry
Gary Lottridge Faulkner, Ph.D., Assistant Professor of Sociology and Anthropology
Robert Morcom Fearn, Ph.D., Associate Professor of Economics
James K. Ferrell, Ph.D., Alcoa Professor and Head of the Department of Chemical Engineering
Alan Bruce Finger, M.S., Instructor in Computer Science
Roger Carl Fites, Ph.D., Associate Professor of Botany

Henry Pridgen Fleming, Ph.D., Associate Professor (USDA) of Food Science
John Erwin Franke, Ph.D., Assistant Professor of Mathematics
William Glenwood Franklin, Ph.D., Associate Professor of English
Leon David Freedman, Ph.D., Professor of Chemistry
John Frink Freeman, M.S., Instructor in Engineering Graphics
Ronald Owen Fulp, Ph.D., Professor of Mathematics

G

Merna Dee Galassi, Ed.M., Visiting Assistant Professor of Guidance and Personnel Services
William Sylvan Galler, Ph.D., Associate Professor of Civil Engineering
Dennis Evo Garoutte, Ph.D., Assistant Professor of Mathematics
James Wade Gault, Ph.D., Associate Professor of Electrical Engineering
Ralph Gellar, Ph.D., Assistant Professor of Mathematics
Thomas V. Gemmer, M.S., Teaching Technician in Forestry and Wood and Paper Science
Forrest William Getzen, Ph.D., Professor of Chemistry
John Richard Gibson, S.T.M., Teaching Technician in Education
George Gosselin Giddings, Ph.D., Assistant Professor of Food Science
John Henderson Gilbert, Ph.D., Associate Professor of Politics
Stanley Eugene Gilliland, Ph.D., Associate Professor of Food Science
Raymond Leroy Gilmore, M.S.W., Visiting Assistant Professor of Sociology and Anthropology
Robert C. Gilmore, M.W.S., Associate Professor of Wood and Paper Science
Chester Eugene Gleit, Ph.D., Associate Professor of Chemistry
Gabriel Gonzalez, Ph.D., Assistant Professor of Foreign Languages
Guy Vernon Gooding, Jr., Ph.D., Professor of Plant Pathology
Thomas Frederick Gordon, M.A.T., Instructor in Mathematics
Larry Frank Grand, Ph.D., Associate Professor of Plant Pathology and Forestry
Max Edwin Gregory, Ph.D., Extension Professor of Food Science
Edward Dewitt Gurley, Ph.D., Associate Professor of Engineering Science and Mechanics

H

William Leroy Hafley, Ph.D., Associate Professor of Forestry and Statistics
Francis J. Hale, Sc.D., Professor of Mechanical Engineering
George Lincoln Hall, Ph.D., Professor of Physics
Max Halperen, Ph.D., Professor of English
Donald Dale Hamann, Ph.D., Associate Professor of Food Science and Biological and Agricultural Engineering
Pat Brooks Hamilton, Ph.D., Professor of Poultry Science and Microbiology
Kenneth William Hanck, Ph.D., Associate Professor of Chemistry
Arthur Paul Hansen, Ph.D., Associate Professor of Food Science
Donald Joseph Hansen, Ph.D., Assistant Professor of Mathematics
Durwin Melford Hanson, Ph.D., Professor of Industrial and Technical Education and Head of the Department of Industrial and Technical Education
James Walker Hardin, Ph.D., Professor of Botany and Forest Resources
Harry Allen Hargrave, Ph.D., Associate Professor of English
Cleon Wallace Harrell, Jr., M.A., Associate Professor of Economics
Walter Joel Harrington, Ph.D., Professor of Mathematics
William Charles Harris, Ph.D., Associate Professor of History
Robert Edward Hartwig, Ph.D., Associate Professor of Mathematics
Wayne Earle Haskin, M.A., Assistant Professor of English
Francis Jefferson Hassler, Ph.D., William Neal Reynolds Professor of Biological and Agricultural Engineering and Head of the Department of Biological and Agricultural Engineering

John Reid Hauser, Ph.D., Professor of Electrical Engineering
Kerry Shuford Havner, Ph.D., Associate Professor of Civil Engineering
Edward Charles Hayes, III, Ph.D., Assistant Professor of Microbiology
Mary Kaleel Head, Ph.D., Extension Associate Professor of Food Science
William Joseph Head, Ph.D., Assistant Professor of Civil Engineering
Allen Streeter Heagle, Ph.D., Associate Professor (USDA) of Plant Pathology
Teddy Theodore Hebert, Ph.D., Professor of Plant Pathology and Genetics
Clinton Louis Heimbach, Ph.D., Professor of Civil Engineering
Forrest Clyde Hentz, Jr., Ph.D., Professor of Chemistry and Assistant Head for Undergraduate Instruction of Chemistry
George Henry Hepting, Ph.D., Adjunct Professor of Plant Pathology and Forestry
Marvin Thomas Hester, Ph.D., Assistant Professor of English
William Lawrence Highfill, Ph.D., Associate Professor of Religion
Charles Horace Hill, Ph.D., Professor of Poultry Science and Animal Science
Mary R. Hilliard, M.Ed., Instructor in Economics
Joseph Patrick Hobbs, Ph.D., Associate Professor of History and Assistant Department Head of History
Robert Lewis Hoffman, Ph.D., Assistant Professor of University Studies
Mary Tipton Holcomb, J.D., Instructor in Economics
Abraham Holtzman, Ph.D., Professor of Politics
Ruth Ball Honeycutt, M.A., Assistant Professor of Mathematics
Maurice William Hoover, Ph.D., Professor of Food Science
William Ernest Hopke, Ed.D., Professor of Guidance and Personnel Services and Head of the Department of Guidance and Personnel Services
Yasuyuki Horie, Ph.D., Associate Professor of Engineering Science and Mechanics
Horace Robert Horton, Ph.D., Professor of Biochemistry
David Hewes Howells, M.S., Director of Water Resources Research Institute, Professor of Biological and Agricultural Engineering
Barney Kuo-Yen Huang, Ph.D., Professor of Biological and Agricultural Engineering
Joseph Paisley Hughes, A.B., Instructor in Economics
Kaye Vaden Hughes, M.A., Instructor in Foreign Languages
Z Zimmerman Hugus, Jr., Ph.D., Professor of Chemistry
Frank Jones Humenik, Ph.D., Associate Professor of Biological and Agricultural Engineering and Associate Head in Charge of Extension
Ervin Grigg Humphries, Ph.D., Professor of Biological and Agricultural Engineering and Engineering Science and Mechanics
James Ernest Huneycutt, Jr., Ph.D., Associate Professor of Mathematics
Jacob Allan Hurwitz, Ph.D., Assistant Professor of Politics
Elvan Edward Hutchison, M.S., Assistant Professor of Textile Technology
Theodore Martin Hyman, Ph.D., Assistant Professor of Sociology and Anthropology

I

John E. Ikerd, Ph.D., Extension Associate Professor of Economics
William Prentiss Ingram, Jr., Ph.D., Assistant Professor and Assistant Head of Chemistry
Stanley Dean Ivie, Ed.D., Associate Professor of Education

J

Lance Flippin Jeffers, M.A., Associate Professor of English
Judith M. Jeffreys, M.A., Instructor in Economics
Alvin Wilkins Jenkins, Jr., Ph.D., Professor of Physics
Samuel Forest Jenkins, Jr., Ph.D., Associate Professor of Plant Pathology
Laurens Gifford Jervis, M.F., Assistant Professor of Forestry
Elisabeth Marie Jezierski, M.A., Instructor in Foreign Languages
Bobby Ray Johnson, Ph.D., Assistant Professor of Food Science

Charles E. Johnson, Ph.D., Assistant Professor of Psychology
Joseph Clyde Johnson, Ed.D., Professor of Psychology
William Hugh Johnson, Ph.D., Professor of Biological and Agricultural Engineering
William Rodgers Johnston, M.S., Assistant Professor of Chemistry
Charles Parker Jones, Ph.D., Associate Professor of Economics
James Robert Jones, Ph.D., Extension Associate Professor of Animal Science
Lawrence Keith Jones, Ph.D., Assistant Professor of Guidance and Personnel Services
Louis Allman Jones, Ph.D., Associate Professor of Chemistry
Victor Alan Jones, Ph.D., Associate Professor of Food Science and Biological and Agricultural Engineering
Harold James Joseph, Ph.D., Instructor in English

K

Joseph Stephen Kahn, Ph.D., Professor of Botany and Biochemistry
Stephen Daniel Kanyr, M.E., Instructor in Economics
Abdel-Aziz Ismail Kashef, Ph.D., Professor of Civil Engineering
Gerald Howard Katzin, Ph.D., Associate Professor of Physics
Herman Thomas Kearny, Jr., B.A., Instructor in History
Harold Keating, M.Ed., Associate Professor of Physical Education
Harvey G. Kebschull, Ph.D., Associate Professor of Politics
Robert Clay Kellison, Ph.D., Assistant Professor of Forestry
John Rivard Kelly, Ph.D., Associate Professor of Foreign Languages
Myron William Kelly, Ph.D., Assistant Professor of Wood and Paper Science
James Allen Kilby, Jr., Ph.D., Assistant Professor of English
Kyong-Dong Kim, Ph.D., Assistant Professor of Sociology and Anthropology
Richard Adams King, Ph.D., M.G. Mann Professor of Economics
Donald Robert Kloe, Ph.D., Assistant Professor of Foreign Languages
Richard Bennett Knight, M.S., L. L. Vaughan Professor of Mechanical Engineering
James Arthur Knopp, Ph.D., Associate Professor of Biochemistry
Albert Sidney Knowles, Jr., M.A., Professor of English
Malcolm Shepherd Knowles, Ph.D., Professor of Adult and Community College Education
Jerome William Koenigs, Ph.D., Adjunct Associate Professor of Plant Pathology and Forestry
Kwangil Koh, Ph.D., Professor of Mathematics
John Ronald Kolb, Ph.D., Associate Professor of Mathematics and Mathematics and Science Education
Benjamin Granade Koonce, Jr., Ph.D., Professor of English
Elmer George Kuhlman, Ph.D., Adjunct Associate Professor of Plant Pathology and Forestry

L

Thomas Joseph Lada, Ph.D., Assistant Professor of Mathematics
Joe Oscar Lammi, Ph.D., Professor of Forestry
Leonard Jay Langfelder, Ph.D., Professor of Civil Engineering and Director of Center for Marine and Coastal Studies
John Sumner Lapp, Ph.D., Assistant Professor of Economics
Neil Arden Lapp, Ph.D., Adjunct Assistant Professor of Plant Pathology
Kurt John Leonard, Ph.D., Associate Professor (USDA) of Plant Pathology
William Russell Leonhardt, M.S., Associate Professor of Physical Education
Michael Phillip Levi, Ph.D., Associate Professor of Wood and Paper Science, Plant Pathology, and Extension Wood Products Specialist
Samuel Gale Levine, Ph.D., Professor of Chemistry

Paul Edwin Lewis, Ph.D., Professor of Mathematics
Will Lithgow Liddell, Jr., Ph.D., Assistant Professor of Engineering Science and Mechanics
Hugh L. Liner, Ph.D., Extension Associate Professor of Economics
Charles Howie Little, Jr., M.A., Associate Professor of Mathematics
Richard Henry Loeppert, Ph.D., Professor of Chemistry and Assistant to the Head of the Department of Chemistry
G. Gilbert Long, Ph.D., Professor of Chemistry
Ian Stewart Longmuir, M.B.B. Chir., Professor of Biochemistry
Doris Marie Lucas, Ph.D., Assistant Professor of English
George Blanchard Lucas, Ph.D., Professor of Plant Pathology
Leon Thomas Lucas, Ph.D., Associate Professor of Plant Pathology
Geraldine Hobson Luginbuhl, Ph.D., Assistant Professor of Microbiology
Jiang Luh, Ph.D., Professor of Mathematics

M

David Franklin McAllister, Ph.D., Assistant Professor of Computer Science
Robert Barton McBurney, Jr., M.B.A., Assistant Professor of Economics
Jackson Mearns McClain, Ph.D., Associate Professor of Politics
William Fred McClure, Ph.D., Associate Professor of Agricultural Engineering
Kathleen Anderton McCutcheon, M.A., Assistant Professor of Education
Wendell Herbert McKenzie, Ph.D., Assistant Professor of Genetics
Philip Keith McKnelly, Ph.D., Assistant Professor of Recreation Resources Administration
Francis Edward McVay, Ph.D., Professor of Statistics
Jerry Lee Machemehl, Ph.D., Assistant Professor of Civil Engineering
Clarence Joseph Maday, Ph.D., Associate Professor of Engineering Science and Mechanics
Alexander Russell Main, Ph.D., Professor of Biochemistry
Charles Edward Main, Ph.D., Associate Professor of Plant Pathology
T. Ewald Maki, Ph.D., Carl Schenck Professor of Forestry
Herbert Rooney Malcom, Jr., Ph.D., Assistant Professor of Civil Engineering
John Philip Malcom, Ph.D., Assistant Professor of English
Armstrong Maltbie, B.S., Associate Professor of Mathematics
Elizabeth Hines Manning, A.B., Instructor in Chemistry
Edward Raymond Manring, Ph.D., Professor of Physics
Joe Alton Marlin, Ph.D., Associate Professor of Mathematics
Culpepper Paul Marsh, M.S., Professor of Sociology and Anthropology
Betty R. Martin, Ed.D., Visiting Instructor in Guidance and Personnel Services
David Hamilton Martin, M.S., Associate Professor of Physics
Robert H. Martin, Jr., Ph.D., Associate Professor of Mathematics
Joseph Mastro, Ph.D., Assistant Professor of Politics
Gennard Matrone, Ph.D., William Neal Reynolds Professor of Biochemistry and Animal Science and Head of the Department of Biochemistry
Kenneth C. Mayer, M.A., Visiting Instructor in Industrial Arts Education
Charles Venable Mercer, Ph.D., Associate Professor of Sociology and Anthropology
Donald Hartland Mershon, Ph.D., Assistant Professor of Psychology
Michael Thomas Mettrey, Ph.D., Adjunct Assistant Professor of Engineering Science and Mechanics
Robert Stephen Metzger, Ph.D., Associate Professor of Philosophy
Carl Dean Meyer, Jr., Ph.D., Associate Professor of Mathematics
Henry Moore Middleton, Jr., B.S., Assistant Professor of Textile Technology
Joseph Leonard Middleton, M.A., Associate Professor of Philosophy and Religion
Marion Lawrence Miles, Ph.D., Associate Professor of Chemistry
Robert Donald Milholland, Ph.D., Professor of Plant Pathology
Howard George Miller, Ph.D., Professor of Psychology and Head of the Department of Psychology

Latham Lee Miller, M.A., Associate Professor of Recreation Resources Administration
Norman C. Miller, Jr., M.S., Extension Professor of Food Science
Texton Robert Miller, Ph.D., Associate Professor of Agricultural Education
Theodore Milton Miller, B.S., Extension Specialist in Food Science
Jehangir Farhad Mirza, Ph.D., Associate Professor of Civil Engineering
Robert James Monroe, Ph.D., Professor of Statistics
Catherine Elizabeth Moore, Ph.D., Assistant Professor of English
Clifford James Moore, Jr., Ph.D., Associate Professor of Mechanical Engineering
Charles Galloway Morehead, Ed.D., Professor Emeritus of Guidance and Personnel Services
Charles Glen Moreland, Ph.D., Professor of Chemistry
William Edwin Moser, B.S., Associate Professor of Textile Technology
Ralph Lionel Mott, Ph.D., Associate Professor of Botany
James Andrew Mulholland, M.A., Instructor in History
Wesley Grigg Mullen, Ph.D., Professor of Civil Engineering
Harry Eugene Munn, Jr., Ph.D., Assistant Professor of English and Education
Robert David Mustian, Ph.D., Associate Professor of Sociology and Anthropology

N

Richard I. Nagel, A.B., Instructor in Philosophy
Howard Movess Nahikian, Ph.D., Professor of Mathematics and Assistant to the Department Head
Douglas Thomas Nelson, M.A., Instructor in History
Joseph Taft Nerden, Ph.D., Professor Emeritus of Industrial Education
Paul Adrian Nickel, Ph.D., Professor of Mathematics
Gifford Spruce Nickerson, Ph.D., Assistant Professor of Sociology and Anthropology
Lowell Wendell Nielsen, Ph.D., Professor of Plant Pathology
Glenn Ray Noggle, Ph.D., Professor of Botany and Head of Department of Botany
Charles Joseph Nusbaum, Ph.D., William Neal Reynolds Professor Emeritus of Plant Pathology

O

John O'Connell, D.Ed., Visiting Professor of Adult and Community College Education
Eduardo Augusto Ostergren, M.M., Assistant Director of Music
Michael Ray Overcash, Ph.D., Assistant Professor of Biological and Agricultural Engineering and Chemical Engineering
Hubert Lowell Owen, B.S., Instructor in Physics

P

Lavon Barry Page, Ph.D., Associate Professor of Mathematics
Steven K. Palmer, M.E., Instructor in Economics
Chia-Ven Pao, Ph.D., Associate Professor of Mathematics
James Edwin Pardue, B.S., Associate Professor of Textile Technology
Hubert Vern Park, Ph.D., Professor of Mathematics and Associate Head of the Mathematics Department
Charles Alexander Parker, Ph.D., Professor of English
George William Parker, III, Ph.D., Assistant Professor of Physics
Willis Melvin Parker, M.S., Instructor in Industrial and Technical Education
Sandra O. Paur, Ph.D., Assistant Professor of Mathematics
John Noble Perkins, Ph.D., Professor of Mechanical Engineering
Jerome John Perry, Ph.D., Professor of Microbiology
Thomas Oliver Perry, Ph.D., Professor of Forestry, Genetics and Landscape Architecture

Howard Aldridge Petrea, M.A., Associate Professor of Mathematics
Todd H. Pierce, Ph.D., Assistant Professor of Mechanical and Aerospace Engineering
William Peter Pinna, J.D., Assistant Professor of Economics
Pearl S. Poole, Ed.D., Visiting Instructor in Guidance and Personnel Services
Joseph Alexander Porter, Jr., M.S., Professor of Textile Technology
Ira Deward Porterfield, Ph.D., Professor of Animal Science and Head of the Department of Animal Science
Nathaniel Thomas Powell, Ph.D., Professor of Plant Pathology and Genetics
Walter Ray Prince, Ph.D., Assistant Professor of Poultry Science
Albert Ernest Purcell, Ph.D., Professor (USDA) of Food Science

R

Robert Todd Ramsay, Ph.D., Assistant Professor of Mathematics
Gary Raymond Rassel, M.A., Instructor in Politics
Horace Darr Rawls, Ph.D., Professor of Sociology and Anthropology
Rachel F. Rawls, Ph.D., Associate Professor of Psychology
Bibekananda Ray, Ph.D., Visiting Assistant Professor of Food Science
George Goodwyn Reeves, Ph.D., Assistant Professor of Electrical Engineering
Thomas Howard Regan, Ph.D., Associate Professor of Philosophy
Richard Allyn Reinert, Ph.D., Associate Professor (USDA) of Plant Pathology
Charles Russell Reynolds, Ph.D., Assistant Professor of Foreign Languages
Michael Shane Reynolds, Ph.D., Associate Professor of English
John Marion Riddle, Ph.D., Associate Professor of History
Woodrow Ernest Robbins, Ph.D., Assistant Professor of Computer Science
Jerry Robinson, Ph.D., Visiting Professor of Adult and Community College Education
Charles N. Rogers, B.S., Associate Professor of Wood and Paper Science
Roger P. Rohrbach,Ph.D., Associate Professor of Biological and Agricultural Engineering
John Paul Ross, Ph.D., Professor (USDA) of Plant Pathology
John Arthur Roulier, Ph.D., Assistant Professor of Mathematics
Idonna Emmons Russell, M.S.W., Assistant Professor of Sociology and Anthropology

S

Ronald Herbert Sack, Ph.D., Associate Professor of History
Hans Sagan, Ph.D., Professor of Mathematics
Joseph Neal Sasser, Ph.D., Professor of Plant Pathology
Robert Garner Savage, M.S., Assistant Professor of Mathematics
LeRoy Charles Saylor, Ph.D., Professor of Forestry and Genetics and Associate Dean of Forest Resources
Anton Franz Schreiner, Ph.D., Associate Professor of Chemistry
Wayland Pritchard Seagraves, M.S., Associate Professor of Electrical Engineering
James F. Selgrade, Ph.D., Assistant Professor of Mathematics
Ernest Davis Seneca, Ph.D., Associate Professor of Botany and Soil Science
Graye Johnson Shaw, M.S., Instructor in Chemistry
K. B. Sherbine, Ph.D., Visiting Assistant Professor of Biology
Vernon Frederick Shogren, M.Arch., Professor of Architecture
Thomas Clinard Shore, Jr., Ed.D., Assistant Professor of Industrial and Technical Education
Douglas Dean Short, Ph.D., Assistant Professor of English
James Owen Shurling, B.D., Instructor in Sociology and Anthropology
Robert Silber, Ph.D., Assistant Professor of Mathematics
Sofus Emmelöv Simonsen, M.A., Assistant Professor of Foreign Languages
Edward Carroll Sisler, Ph.D., Associate Professor of Crop Science and Biochemistry

Richard W. Skaggs, Ph.D., Associate Professor of Biological and Agricultural Engineering and Soil Science
Charles Smallwood, Jr., M.S., Professor of Civil Engineering
Elizabeth Ann Smaltz, M.Ed., Assistant Professor of Physical Education
Farmer Sterling Smith, Ed.D., Associate Professor of Industrial and Technical Education
Frank James Smith, Ph.D., Assistant Professor of Psychology
J. C. Smith, Ph.D., Associate Professor of Civil Engineering
Norwood Graham Smith, M.A., Associate Professor of English
William Edward Smith, Ed.D., Professor of Recreation Resources Administration
Marvin Stanley Soroos, Ph.D., Assistant Professor of Politics
Russell Melvin Southall, Ph.D., Assistant Professor of Horticultural Science
Robert S. Sowell, Ph.D., Associate Professor of Biological and Agricultural Engineering
Jason Loy Sox, Jr., Ph.D., Assistant Professor of Mathematics
Marvin Luther Speck, Ph.D., William Neal Reynolds Professor of Food Science and Microbiology
Herbert Elvin Speece, Ph.D., Professor of Mathematics and Mathematics and Science Education and Head of Department of Mathematics and Science Education
William Henry Spence, Ph.D., Associate Professor of Geosciences
Harvey Wesley Spurr, Jr., Ph.D., Professor (USDA) of Plant Pathology
Clayton Lee Stalnaker, M.A., Instructor in University Studies and Acting Head of University Studies
Ephraim Stam, Ph.D., Associate Professor of Nuclear Engineering
Donald Henry John Steensen, Ph.D., Associate Professor of Forestry and Wood and Paper Science
Darrell John Steffensmeier, Ph.D., Assistant Professor of Sociology and Anthropology
Allen Frederick Stein, Ph.D., Associate Professor of English
Robert Elmer Sternloff, Ph.D., Professor of Recreation Resources Administration
Debra W. Stewart, M.A., Instructor in Politics
Bill Junior Stines, M.S., Associate Statistician
Ernest Lester Stitzinger, Ph.D., Associate Professor of Mathematics
David Lewis Strider, Ph.D., Professor of Plant Pathology
William Clifton Stuckey, Jr., M.S., Associate Professor of Textile Technology
Jon M. Sticky, Ph.D., Assistant Professor of Botany
Charles Wilson Suggs, Ph.D., Professor of Biological and Agricultural Engineering
Paul Porter Sutton, Ph.D., Professor of Chemistry
Elizabeth Manny Suval, Ph.D., Associate Professor of Sociology and Anthropology
Harold Everett Swaisgood, Ph.D., Professor of Food Science
William Lawrence Switzer, Ph.D., Assistant Professor of Chemistry
Richard Eugene Sylla, Ph.D., Associate Professor of Economics

T

Fred Russell Tarver, Jr., Ph.D., Extension Associate Professor of Food Science
Alan Lee Tharp, Ph.D., Assistant Professor of Computer Science
Elizabeth C. Theil, Ph.D., Assistant Professor of Biochemistry
Frank Bancroft Thomas, Ph.D., Extension Professor of Food Science
Patricia Lysbeth Tobin, Ph.D., Assistant Professor of Sociology and Anthropology
Samuel B. Tove, Ph.D., Professor of Animal Science and Biochemistry
Hedwig Hirschmann Triantaphyllou, Ph.D., Professor of Plant Pathology
Robert Tinnen Troxler, M.I.A., Assistant Professor of Industrial Arts
Harry Tucker, Jr., Ph.D., Associate Professor of Foreign Languages
William Preston Tucker, Ph.D., Professor of Chemistry and Biochemistry
Chi Chao Tung, Ph.D., Associate Professor of Civil Engineering
Carl Byron Turner, Ph.D., Professor of Economics

U

David Frederick Ullrich, Ph.D., Assistant Professor of Mathematics
Mehmet Ensar Uyanik, Ph.D., Professor of Civil Engineering
Odell Uzzell, Ph.D., Associate Professor of Sociology and Anthropology

V

John Valentine, Ph.D., Visiting Professor of Adult and Community College Education
William John Vanderwall, Ph.D., Assistant Professor of Freshman Engineering Division
Albert Donald VanDeVeer, Ph.D., Associate Professor of Philosophy
Cecil Gerald Van Dyke, Ph.D., Assistant Professor of Plant Pathology and Botany
Robert Allen Voelker, Ph.D., Visiting Assistant Professor of Genetics

W

George Henry Wahl, Jr., Ph.D., Associate Professor of Chemistry
Harvey Edward Wahls, Ph.D., Professor and Graduate Administrator of Civil Engineering
Gary Eugene Wall, M.S., Instructor in Physical Education
John Nelson Wall, Jr., Ph.D., Assistant Professor of English
James Macaulay Wallace, Ph.D., Assistant Professor of Sociology and Anthropology
William Mood Walter, Jr., Ph.D., Associate Professor (USDA) of Food Science
Arthur Walter Waltner, Ph.D., Professor of Physics
Thomas Marsh Ward, Ph.D., Assistant Professor of Chemistry
Frederick Gail Warren, Ph.D., Professor of Food Science
Marlin Roger Warren, Jr., Dr. of Rec., Associate Professor of Recreation Resources Administration
William Meade Waters, Jr., Ph.D., Assistant Professor of Mathematics and Science Education and Mathematics
Gerald Francis Watson, Jr., Ph.D., Assistant Professor of Meteorology
Benjamin Davis Webb, M.S., Instructor in Freshman Engineering
Neil Broyles Webb, Ph.D., Associate Professor of Food Science
Allen Howard Weber, Ph.D., Associate Professor of Meteorology
Frederick Lovejoy Wellman, Ph.D., Professor Emeritus of Plant Pathology
J. C. Wells, M.S.A., Extension Professor of Plant Pathology
Ronald Earle Welty, Ph.D., Associate Professor (USDA) of Plant Pathology
Dennis William Wertz, Ph.D., Associate Professor of Chemistry
Harry Carter West, Ph.D., Associate Professor of English
Bert Whitley Westbrook, Ed.D., Associate Professor of Psychology
Raymond Cyrus White, Ph.D., Professor of Chemistry
Robert Benjamin White, Jr., Ph.D., Professor of English and Assistant Head of the Department of English
Robert Ernest White, Ph.D., Assistant Professor of Mathematics
Norman F. Williamson, Jr., Ph.D., Assistant Professor of Computer Science
Beth Evelyn Wilson, B.S., Teaching Technician in Recreation Resources Administration
Jack Wilfred Wilson, Ph.D., Associate Professor of Economics
James Blake Wilson, Ph.D., Associate Professor of Mathematics
John Henry Wilson, Jr., M.S., Extension Assistant Professor of Horticultural Science and Plant Pathology and Pesticide Education Specialist
Ronald C. Wimberley, Ph.D., Assistant Professor of Sociology and Anthropology
Whitton Philip Windham, M.S., Special Lecturer in Economics
Lowell Sheridan Winton, Ph.D., Professor of Mathematics
Edward Hempstead Wiser, Ph.D., Professor of Biological and Agricultural Engineering

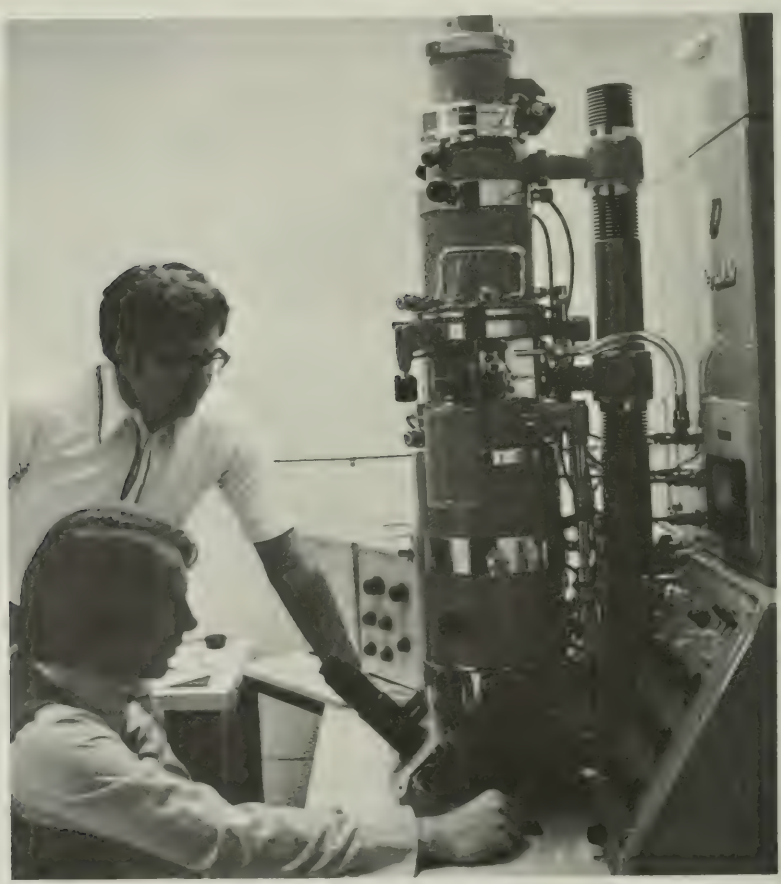
Augustus McIver Witherspoon, Ph.D., Assistant Professor of Botany
Joseph Raymond Woodard, M.S., Extension Professor of Animal Science
Tommy Elmer Wynn, Ph.D., Assistant Professor of Botany

Y

James Herbert Young, Ph.D., Associate Professor of Biological and Agricultural Engineering
James Neal Young, Ph.D., Professor of Sociology and Anthropology
Robert Vaughan Young, Jr., Ph.D., Assistant Professor of English
Talmadge Brian Young, Ed.D., Associate Professor of Industrial Arts

Z

Paul Zung-Teh Zia, Ph.D., Professor of Civil Engineering and Associate Head of the Department
Bruce John Zobel, Ph.D., Edwin F. Conger Professor of Forestry and Genetics



Summer sessions allows students to continue their studies utilizing special equip ment, such as the electron microscope being used here by a professor and graduat student in materials engineering.

UNIVERSITY DISRUPTIONS POLICY AND PROCEDURES

POLICIES, PROCEDURES, AND DISCIPLINARY ACTIONS IN CASES OF DISRUPTION OF THE EDUCATIONAL PROCESS

The following statements concerning policies, procedures, and disciplinary actions in cases of disruption of the educational process were approved by the Trustees of the University of North Carolina and as such they remain in effect until modified by action by the Board of Governors of the new University system or by the Trustees of North Carolina State University.

Section 1. Policies Relating to Disruptive Conduct

The University of North Carolina has long honored the right of free discussion and expression, peaceful picketing and demonstrations, the right to petition and peaceably to assemble. That these rights are a part of the fabric of this institution is not questioned. They must remain secure. It is equally clear, however, that in a community of learning willful disruption of the educational process, destruction of property, and interference with the rights of other members of the community cannot be tolerated. Accordingly, it shall be the policy of the University to deal with any such disruption, destruction or interference promptly and effectively, but also fairly and impartially without regard to race, religion, sex or political beliefs.

Section 2. Definition of Disruptive Conduct

(a) Any faculty member (the term "faculty member", wherever used in this policy shall include regular faculty members, full-time instructors, lecturers, and all other persons exempt from the North Carolina State Personnel System [Chapter 126 of the General Statutes as amended] who receive compensation for teaching, or other instructional functions, or research at the University), any graduate student engaged in the instructional program, or any student who, with the intent to obstruct or disrupt any normal operation or function of the University or any of its component institutions, engages, or incites others to engage, in individual or collective conduct which destroys or significantly damages any University property, or which impairs or threatens impairment of the physical well-being of any member of the University community, or which, because of its violent, forceful, threatening or intimidating nature or because it restrains freedom of lawful movement, otherwise prevents any member of the University community from conducting his normal activities within the University, shall be subject to prompt and appropriate disciplinary action, which may include suspension, expulsion, discharge or dismissal from the University.

The following, while not intended to be exclusive, illustrate the offenses encompassed herein, when done for the purpose of obstructing or disrupting any normal operation or function of the University or any of its component institutions: (1) occupation of any University building or part thereof with intent to deprive others of its normal use; (2) blocking the entrance or exit of any University building or corridor or room therein with intent to deprive others of lawful access to or from, or use of, said building or corridor or room; (3) setting fire to or by any other means destroying or substantially damaging any University building or property, or the property of others on University premises; (4) any possession or display of, or attempt or threat to use, for any unlawful purpose, any weapon, dangerous instrument, explosive, or inflammable material in any University building or on any University campus; (5) prevention of, or attempt to prevent by physical act, the attending, convening, continuation or orderly conduct of any University class or activity or of any lawful meeting or assembly in any University building or on any

University campus; and (6) blocking normal pedestrian or vehicular traffic on or into any University campus.

(b) Any person engaged in the instructional program who fails or refuses to carry out validly assigned duties, with the intent to obstruct or disrupt any normal operation or function of the University or any of its component institutions, shall be subject to prompt and appropriate disciplinary action under this policy if (but only if) his status is such that he is not subject to the provisions of Section 603 of Chapter VI of the Code of the University of North Carolina.

Section 3. Responsibilities of Chancellors

(a) When any Chancellor has cause to believe than any of the provisions of this policy have been violated, he shall forthwith investigate or cause to be investigated the occurrence, and upon identification of the parties involved shall promptly determine whether any charge is to be made with respect thereto.

(b) If he decides that a charge is to be made, he shall, within thirty (30) days after he has information as to the identity of the alleged perpetrator of the offense but in no event more than twelve (12) months after the occurrence of the alleged offense, (i) refer the case to the appropriate existing University judicial body, [See Faculty Hearing Committee in Chapter VIII below] or (ii) refer the matter to a Hearing Committee drawn from a previously selected Hearings Panel [See Hearings Panel in Chapter VIII below] which, under this option, is required to implement action for violation of Section 2 (a) or (b) of this Chapter. If the case is referred to an existing University judicial body under (i) above, the procedural rules of that body shall be followed, and subsections (c) through (f) below shall not be applicable. If the matter is referred to a Hearing Committee under (ii) above, the procedural rules prescribed in subsections (c) through (f) below shall be followed.

(c) The accused shall be given written notice by personal service or registered mail, return receipt requested, stating:

(1) The specific violations of this policy with which the accused is charged.

(2) The designated time and place of the hearing on the charge by the Hearing Committee, which time shall be not earlier than seven (7) nor later than ten (10) days following receipt of the notice.

(3) That the accused shall be entitled to the presumption of innocence until found guilty, the right to retain counsel, the right to present the testimony of witnesses and other evidence, the right to cross-examine all witnesses against him, the right to examine all documents and demonstrative evidence adverse to him, and the right to a transcript of the proceedings of the hearing.

(d) The Hearing Committee shall determine the guilt or innocence of the accused. If the person charged is found guilty, the Hearing Committee shall recommend to the Chancellor such discipline as said body determines to be appropriate. After considering such recommendation the Chancellor shall prescribe such discipline as he deems proper. In any event, whether the person is found guilty or not guilty, a written report shall be made by the Chancellor to the President within ten (10) days.

(e) Any person found guilty shall have ten (10) days after notice of such finding in which to appeal to the President of the University. Such an appeal if taken shall be upon the grounds set forth in Section 5.

(f) Any accused person who, without good cause, shall fail to appear at the time and place fixed for the hearing of his case by the Hearing Committee shall be suspended indefinitely or discharged from University employment.

(g) A Chancellor, unless so ordered or otherwise prevented by court, shall not be precluded from carrying out his duties under this policy by reason of any pending action in any State or Federal court. Should a delay occur in prosecuting the charge against the accused because the accused or witnesses that may be necessary to a determination of the charge are involved in State or Federal court actions, the time limitations set forth above in this Section 5-3 shall not apply.

(h) Conviction in any State or Federal court shall not preclude the University or

any of its officers from exercising disciplinary action in any offense referred to in this policy.

(i) Nothing contained in this policy shall preclude the President or any Chancellor from taking any other steps, including injunctive relief or other legal action, which he may deem advisable to protect the best interests of the University.

Section 4. Aggravated Acts or Threatened Repetition of Acts

(a) The Chancellor of each of the component institutions of the University shall appoint an Emergency Consultative Panel which shall be composed of not less than three (3) nor more than five (5) faculty members and not less than three (3) nor more than five (5) students who shall be available to advise with the Chancellor in any emergency. No member of such Panel shall serve for more than one (1) year unless he be reappointed by the Chancellor. The Chancellor may make appointments, either temporary or for a full year, to fill any vacancies which may exist on the Panel.

(b) If, in the judgment of the Chancellor, there is clear and convincing evidence that a person has committed any of the acts prohibited under this policy which, because of the aggravated character or probable repetition of such act or acts, necessitates immediate action to protect the University from substantial interference with any of its orderly operations or functions, or to prevent threats to or acts which endanger life or property, the Chancellor, with the concurrence as hereinafter provided of the Emergency Consultative Panel established pursuant to (a) above, may forthwith suspend such person from the University and bar him from the University campus; provided, however, that in the event of such suspension the person suspended shall be given written notice of the reason for his suspension, either personally or by registered mail addressed to his last known address, and shall be afforded a prompt hearing, which, if requested, shall be commenced within ten (10) days of the suspension. Except for purposes of attending personally any hearings conducted under this policy, the bar against the appearance of the accused on the University campus shall remain in effect until final judgment has been rendered in his case and all appellant proceedings have been concluded, unless such restriction is earlier lifted by written notice from the Chancellor.

(c) A quorum of the Emergency Consultative Panel provided for in (a) above shall consist of not less than four (4) of its members, and the required concurrence shall have been obtained if a majority of such quorum shall indicate their concurrence. The Chancellor shall meet personally with members of such Panel at the time he seeks concurrence, if it is feasible to do so. However, if the circumstances are such that the Chancellor deems it not to be feasible to personally assemble such members, then he may communicate with them or the required number of them individually by telephone or by such other means as he may choose to employ, in which event he may proceed as provided in (b) above after the required majority of such members have communicated their concurrence to him.

(d) In the Chancellor's absence or inability to act, the President may exercise the powers of the Chancellor specified in this Section 4 in the same manner and to the same extent as could the Chancellor but for such absence or inability to act.

Section 5. Right of Appeal

Any person found guilty of violating the provisions of this policy by the Hearing Committee referred to in Section 3 shall have the right to appeal the finding and the discipline imposed upon him to the President of the University. Any such appeal shall be in writing, shall be based solely upon the record, and shall be limited to one or more of the following grounds:

(1) That the finding is not supported by substantial evidence;
(2) That a fair hearing was not accorded the accused; or
(3) That the discipline imposed was excessive or inappropriate.

It shall be the responsibility of the President to make prompt disposition of all such appeals, and his decision shall be rendered within thrity (30) days after receipt of the complete record on appeal.

Section 6. No Amnesty

No administrative official, faculty member, or student of the University shall have authority to grant amnesty or to make any promise as to prosecution or non-prosecution in any court, State or Federal, or before any student, faculty, administrative, or Trustee committee to any person charged with or suspected of violating Section 5-2 (a) or (b) of these Bylaws.

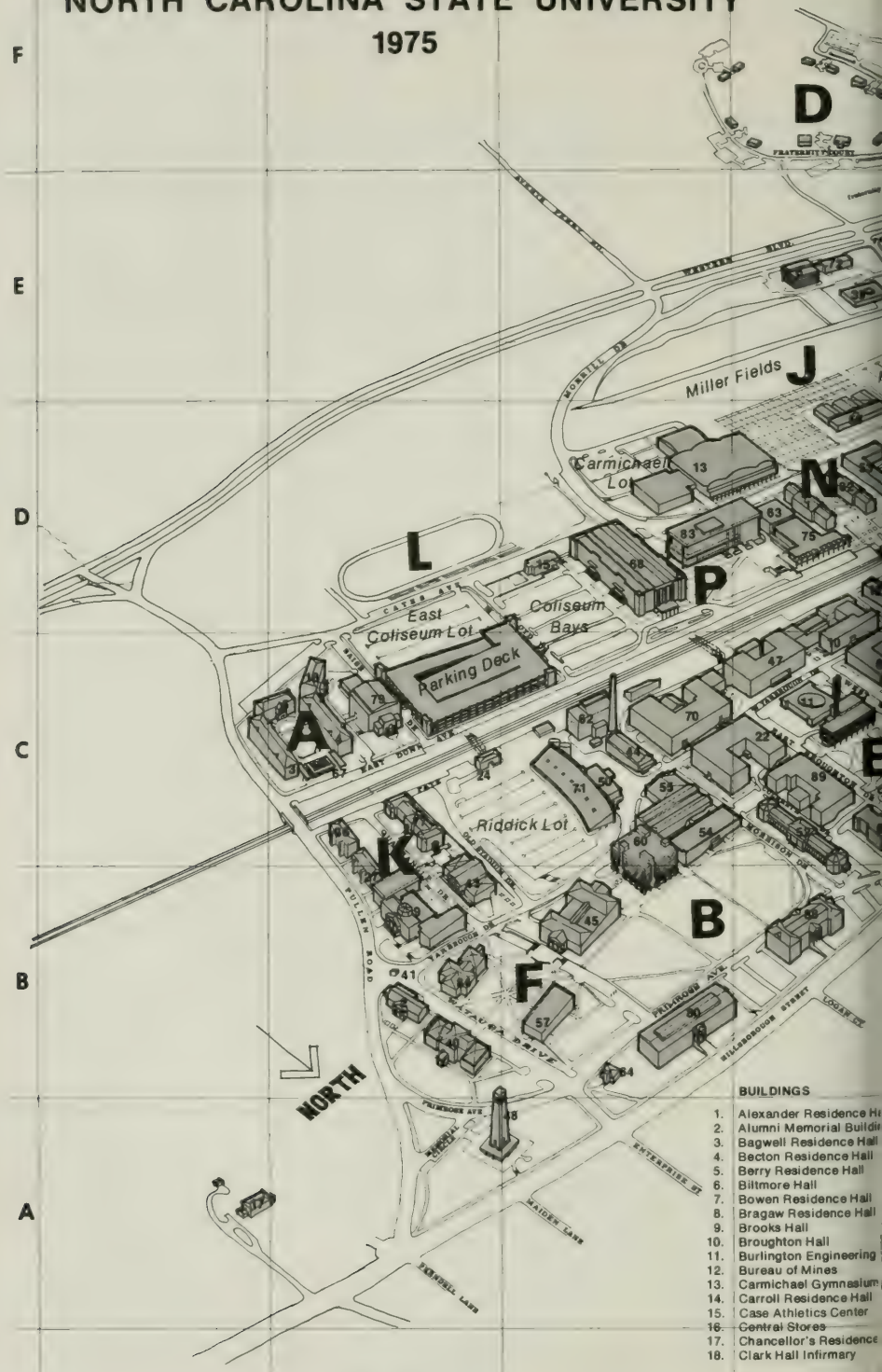
Section 7. Publication

The provisions of this policy shall be given wide dissemination in such manner as the President or Chancellors may deem advisable, and shall be printed in the official catalogues which may be issued by each component institution of the University.

versity.

NORTH CAROLINA STATE UNIVERSITY

1975



	BUILDINGS	GRID	IBM CODE
19.	Clark Laboratories	5-D	CL
20.	Cox Hall	4-D	COX
21	Dabney Hall	4-D	DAB
22.	Daniels Hall	4-C	DAN
23.	Farm Unit 5	6-F	
24.	Field House	2-C	FH
D.	Fraternity Court	4-F	
25.	Gardner Hall	5-D	GA
26.	Gardner Hall Addition	5-D	
27.	Gold Residence Hall	2-C	
28.	Greenhouse—Agronomy	5-D	AGH
29.	Greenhouse—Biological Sciences	5-D	BSG
30.	Greenhouse—Horticulture	5-D	HGH
31.	Greenhouse—840 Method Rd.	8-F	
32.	Greenhouse—Plant Pathology	5-D	PPG
33.	Grinnells Animal Health Lab	5-E	GHL
34.	Harrelson Hall	5-D	HA
35.	Harris Cafeteria	5-D	
36.	D. H. Hill Library-original wing	5-C	DHL
37.	D. H. Hill Library-book stack tower	5-C	
38.	D. H. Hill Library-Erdahl-Cloyd wing	5-C	
39.	Hodges Wood Products Lab	4-E	HWP
40.	Holladay Hall	2-B	
41.	Information Center	2-B	
42.	Kilgore Hall	6-D	KI
43.	King Religious Center	2-B	KRC
44.	Laundry	3-C	
45.	Leazar Hall	3-B	LEZ
46.	Lee Residence Hall	5-E	
47.	Mann Hall	4-C	MN
H.	McKimmon Village (17 apt. bldgs. A-Q)	7-F	
48.	Memorial Tower	3-A	
49.	Metcalf Residence Hall	4-D	
50.	Morris Building	3-C	
51.	Nelson Textile Building	6-D	N
52.	1911 Building	4-C	
53.	Owen Residence Hall	4-D	
54.	Page Hall	3-C	PA
55.	Park Shops	3-C	PS
56.	Patterson Hall	4-C	PT
57.	Peele Hall	3-B	
58.	Physical Plant Shops	4-D	
59.	Phytotron	5-D	PHY
60.	Poe Hall	3-C	POE
61.	Polk Hall	4-C	PK
62.	Power Plant	3-C	
63.	Price Music Center	4-D	PMC
64.	Primrose Hall	3-B	
65.	Print Shop (Existing)	5-D	
66.	Print Shop (Under construction)	6-E	
67.	Quad Snack Bar	2-C	
68.	Wm. Neal Reynolds Coliseum	3-D	
69.	Ricks Hall	4-C	RI
70.	Riddick Engineering Labs	3-C	RD
71.	Riddick Stadium	3-C	
72.	Robertson Wing, Biltmore Hall	4-E	
73.	Schaub Food Science Building	4-E	SFS
74.	Scott Hall	5-D	SC
75.	Students Supply Store	4-D	
76.	Sullivan Residence Hall	6-E	
77.	Syme Residence Hall	2-C	
78.	Television Center	6-F	TVS
79.	Frank Thompson Theater	2-C	TT
80.	Tompkins Hall	3-B	T
81.	Tucker Residence Hall	4-D	
82.	Turlington Residence Hall	4-D	
83.	University Student Center	3-D	USC
84.	Watauga Hall	2-B	
85.	Weaver Laboratories	5-E	DSW
86.	Welch Residence Hall	2-C	
87.	Williams Hall	5-D	WMS
88.	Winston Hall	4-B	WN
89.	Withers Hall	4-C	WI
90.	Turner House	6-C	

	COURTS AND FIELDS	GRID
A.	Becton-Berry Quad	2-C
B.	Court of North Carolina	3-B
C.	Doak Field	6-E
D.	Fraternity Court	4-F
E.	Gardner Arboretum	4-C
F.	Holladay Hall Court	3-B
G.	Lee-Bragaw Court	5-E
H.	McKimmon Village	7-F
J.	Miller Fields	4-E
K.	Syme-Brooks Court	2-C
L.	Track	2-D
M.	Tucker-Owen Court	4-D
N.	Turlington-Alexander Court	4-D
O.	University Plaza	5-C
P.	University Student Center Plaza	3-D

	PARKING LOTS	GRID
	Brooks Avenue Lot	6-C
	Carmichael Lot	3-D
	Coliseum Bays	3-D
	East Coliseum Lot	2-C
	Harris Lot	4-E
	Parking Deck	2-C
	Riddick Lot	3-C
	West Lot	6-E
	Sullivan Lot	6-E
	Sullivan Temporary Lot	7-E

North Carolina State University Bulletin
Director of Summer Sessions
North Carolina State University
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Eighty-Sixth

Annual Commencement

North Carolina State University at Raleigh

addition p. 72

CORRECTED COPY

Saturday, May 17
Nineteen Hundred and Seventy-Five
Degrees Awarded 1974-75

DEGREES CONFERRED

A CORRECTED ISSUE OF UNDERGRADUATE AND GRADUATE DEGREES INCLUDING DEGREES AWARDED JUNE 25, 1974, AUGUST 7, 1974, DECEMBER 18, 1974, AND MAY 17, 1975.

Musical Program

EXERCISES OF GRADUATION

May 17, 1975

CARILLON CONCERT: 8:30 A.M. — The Memorial Tower
Nancy Ridenhour, Carillonneur

COMMENCEMENT BAND CONCERT: 8:45 A.M.

William Neal Reynolds Coliseum

"The Impresario", Overture ..... Mozart

First Suite in Eb ..... Holst

1. Chaconne
2. Intermezzo
3. March

1812 Overture ..... Tchaikovsky

PROCESSIONAL: 9:15 A.M.

March Processional ..... Grundman

RECESSIONAL:

University Grand March ..... Goldman

NORTH CAROLINA STATE UNIVERSITY COMMENCEMENT BAND

Donald B. Adcock, Conductor

Marshals provided by Alpha Phi Omega, Blue Key,
Golden Chain and Golden Theta Delta
Ushers provided by Arnold Air Society and Angel Flight

The Alma Mater

Words by:
Alvin M. Fountain, '23

Music by:
Bonnie F. Norris, Jr., '23

Where the winds of Dixie softly blow
o'er the fields of Caroline,

There stands ever cherished N. C. State,
as thy honored shrine.

So lift your voices! Loudly sing
from hill to oceanside!

Our hearts ever hold you, N. C. State,
in the folds of our love and pride.

Exercises of Graduation

William Neal Reynolds Coliseum

Dr. John Tyler Caldwell, *Chancellor*
Presiding

May 17, 1975

PROCESSIONAL, 9:15 A.M. .....Donald B. Adcock
Conductor, North Carolina State University Commencement Band

The Audience is requested to remain seated during the Processional.

INVOCATION .....Oscar B. Wooldridge
Coordinator of Religious Affairs, North Carolina State University

ADDRESS .....John Tyler Caldwell
Chancellor

CONFERRING OF DEGREES .....John Tyler Caldwell
Chancellor

Candidates for baccalaureate degrees presented by Deans of Schools. Candidates for advanced degrees presented by Dean of the Graduate School.

ADDRESS TO FELLOW GRADUATES .....Robert H. Usry
Class of 1975

ANNOUNCEMENT OF GOODWIFE AND GOODHUSBAND DIPLOMAS ..... Suzanne Smith, *Salutatorian*

ANNOUNCEMENT OF OUTSTANDING TEACHER AWARDS ..... Francis Phillip O'Dell, *Valedictorian*

REMARKS .....William C. Friday
President, University of North Carolina

ALMA MATER

BENEDICTION

RECESSIONAL

The Audience is requested to remain seated until the RECESSIONAL MUSIC is concluded.

Social Hour and Distribution of Diplomas

School and Department Locations

School of Agriculture and Life Sciences – 11:30 a.m.

Adult Education .....1707 Hillsborough Street, Presidential Ballroom, Hilton Inn

Agronomy, Crop Science, Individualized Study Program, Pest Management (for Crop Protection) and Soil Science .....249 and 251 Williams Hall

Animal Science .....2501 Clark Avenue, Fairmont Methodist Church

Biological and Agricultural Engineering .....158 Weaver Laboratories

Biological Sciences .....3533 Gardner Hall

- Biochemistry
- Biological Sciences Major
- Botany
- Entomology
- Genetics
- Microbiology
- Nutrition
- Plant Pathology

Conservation .....222 Dabney Hall or 249 and 251 Williams Hall

Economics .....Nelson Auditorium, 240 Nelson Hall

Food Science .....105 Schaub – Food Science Building

Horticultural Science .....121 and 159 Kilgore Hall

Poultry Science .....Baptist Student Center, 2702 Hillsborough Street

Rural Sociology .....218 Withers Hall

Zoology .....222 Dabney Hall

- Fisheries and Marine Biology
- Medical Technology
- Pre-Dental and Pre-Medical
- Wildlife Biology
- Zoology Majors

School of Design – 11:30 a.m. .....Stewart Theatre

School of Education — 11:30 a.m.

Adult and Community College Education ....Presidential Ballroom, Hilton Inn, 1707 Hillsborough Street

Agricultural Education .....Curriculum Materials Center, 400 Poe Hall

Guidance and Personnel Services .....220 Poe Hall

Industrial Arts Education .....218 Poe Hall

Mathematics and Science Education .....216 Poe Hall

Psychology .....204 Poe Hall

Secondary Education .....211 Poe Hall

Vocational Industrial Education and Technical Education .....412 Poe Hall

School of Engineering — 11:30 a.m.

Biological & Agricultural Engineering .....158 Weaver Laboratories

Chemical Engineering .....115 Riddick Laboratories

Civil Engineering .....Lobby of Mann Hall

Electrical Engineering .....Thompson Theatre

Engineering Science and Mechanics .....117 Riddick Laboratories

Engineering Operations .....242 Riddick Laboratories

Furniture Manufacturing and Management .....234 Riddick Laboratories

Industrial Engineering .....234 Riddick Laboratories

Mechanical and Aerospace Engineering ....University Student Center Ballroom

Materials Engineering .....Conference Room, Alumni Building

Nuclear Engineering .....North Portico, Burlington Engineering Laboratories

School of Forest Resources — 11:30 a.m. .....Carmichael Gymnasium, west end, Main Floor

School of Liberal Arts — 11:30 a.m.

Economics, Business Management, Accounting .....Nelson Textile Auditorium

English, Speech, Foreign Languages, Philosophy, and Multi-disciplinary Studies .....27 Horne Street

History .....Theatre, Erdahl-Cloyd Union

Sociology .....218 Withers Hall

Politics .....Court of North Carolina (off Primrose Avenue) (213 Tompkins Hall in the event of inclement weather)

School of Physical and Mathematical Sciences — 11:30 a.m. .....117 Cox Hall

School of Textiles — 11:30 a.m. .....Forest Hills Baptist Church

ROTC Commissioning Ceremony

Colonel David F. First
Presiding

Stewart Theatre

17 May 1975

PROCESSIONAL MARCH, 2:00 P.M. .....Donald B. Adcock
Conductor, North Carolina State University Commencement Band

The Audience is requested to remain seated until Processional music is completed.

NATIONAL ANTHEM

INVOCATION .....John K. Dempsey
Chaplain, Captain, USAF

INTRODUCTIONS .....John Tyler Caldwell
Chancellor, North Carolina State University

ADDRESS .....Earl G. Peck
Brigadier General, USAF
Chief of Air Force History HQ USAF (CHO)

ADMINISTRATION OF OATH OF OFFICE .....Colonel David F. First
Professor of Aerospace Studies
Colonel Robert E. Lenzner
Professor of Military Science

PRESENTATION OF CERTIFICATES
OF COMMISSION .....Earl G. Peck
Brigadier General, USAF

BENEDICTION .....John K. Dempsey
Chaplain, Captain, USAF

Academic Costume

Academic gowns represent a tradition handed down from the universities of the Middle Ages. These institutions were founded by the Church; the students, being clerics, were obliged to wear the prescribed gowns at all times. Round caps later became square mortarboards; the hoods, originally cowls attached to the gowns, could be slipped over the head for warmth.

Many European universities have distinctive caps and gowns which are different from those commonly used in this country. Some of the gowns are of bright colors and some are embellished with fur. A number of these may be noted in the procession.

The usual color for academic gowns in the United States is black. The bachelor's gown is worn closed, the master's and doctor's may be worn open or closed. The shape of the sleeve is the distinguishing mark of the gown: bachelor—long pointed sleeves; master—oblong, square cut in back with an arc cut away in front; doctor—bell shaped.

Caps are black. The tassels for the Ph.D. degree are gold and those for other graduate and professional degrees may be of the color corresponding to the trimmings on the hoods. The color of the tassels for bachelor's degrees indicates the curriculum of the graduate: Agriculture, maize; Design, brown; Education, light blue; Engineering, orange; Forest Resources, russet; Liberal Arts, white; Physical and Mathematical Sciences, yellow; Textiles, wine red.

The hoods are lined with the color of the institution from which the wearer received his degree. The trimming or collar of the hood is the color which designates the degree: Liberal Arts, white; Fine Arts and Architecture, brown; Science, golden yellow; Music, pink; Divinity, scarlet; Law, purple; Engineering, orange; Philosophy, blue; Medicine, green; Forestry, russet; Textile, wine red.

Honorary degree hoods are distinguished as follows: Master of Arts (M.A.), white; Doctor of Humane Letters (L.H.D.), white; Doctor of Sciences (Sc.D.), golden yellow; Doctor of Divinity (D.D.), scarlet; Doctor of Laws (L.L.D.), purple.

DEGREES CONFERRED

May 17, 1975

School of Agriculture and Life Sciences

BACHELOR OF SCIENCE IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

Jointly administered by the School of Agriculture and Life Sciences and the School of Engineering. See page 20 under the School of Engineering for a listing of the graduating seniors in the jointly administered program.

BACHELOR OF SCIENCE IN CONSERVATION

Jointly administered by the School of Agriculture and Life Sciences and the School of Forest Resources.

Stephen Michael Bereznai ..... Paulsboro, NJ
Robert Bruce Howard Blanchard ..... Highland Park, NJ
Sue New Brown ..... Fayetteville
Larry Thomas Chewning ..... Goldsboro
Chester Weax Clark ..... Rocky Mount
Anthony Bernic Congleton ..... Raleigh
Gary Alan Denny ..... Durham
Richard Earl Holland, Jr. ..... Williamsburg, VA
Robert Baker Julian, Jr. ..... Salisbury
Kurt Russell Lovell ..... Hagerstown, MD
H**Roy Lee Mathis, Jr. ..... Roaring River
*Terry Lynne McElrath ..... Black Mountain
Benny Eugene Myers ..... Hamptonville

* Honors ** High Honors H Honors Program

Sheila Foster Nichols ..... Wilkesboro
John Alexander Parker ..... Greensboro
Daniel Lee Potter ..... Reelsboro
Barry Franklin Rudd ..... Burlington
Wesley Lucas Scott ..... Brown Summit
**William Vereen Terry ..... Raleigh
Ricky Alexander Wagoner ..... Hamptonville
George Norman White, Jr. ..... Plymouth
Perry William Wyatt ..... Robbins

BACHELOR OF SCIENCE

Agricultural Economics

Lucius Perry Bell, III ..... Statesville
Garland Douglas Cahoon ..... Arapahoe
John Herbert Cox ..... Clarkton
Tony Michael Farmer ..... Sparta
William Dale Helms ..... Concord
Herbert Spencer Holding, III ..... Wake Forest
Stuart Edward Howard ..... Richlands
Pamela Beason Keener ..... Charlotte
Dennis Waymon King ..... Charlotte
H*Gary Harold Sullivan ..... Wilson
Robert Harmon Usry ..... Raleigh
**George Paul VanDusen ..... Washington
Victor Daniel Wu ..... Hong Kong

Agronomy

Donald Wayne Cobb ..... Liberty
Herman Anthony Cobb ..... Franklin, VA
William Raymond Dorsett ..... Randleman
Terry Charles Edsel ..... Moravian Falls
Joseph Allison Hinton ..... Zebulon
Roger Earl Johnson ..... Winston-Salem
James Ross Krueck ..... Greensboro
Larry Locklear ..... Shannon
Liston Lee Mallard, III ..... Kinston
Michael Phillip McKinney ..... Greensboro
Emmett Scott Shoulars ..... Rich Square

Animal Science

*Tate Boys Sterrett Allen ..... Charlotte
*David Lee Allred ..... Robbins
Emily Hall Benton ..... Roanoke Rapids
H*Stephen Lewis Brewbaker ..... Raleigh
*Alan Jay Brodsky ..... Broomall, PA
Dennis Earl Burleson ..... New London
**Aubrey Lee Cartwright, Jr. ..... Elizabeth City
Clarence Merrick Chenoweth, Jr. ..... Upperco, MD

* Honors ** High Honors H Honors Program

Rebecca Jean Clapp ..... Marion
John Stephen Cooper ..... Pittsboro
Irvin Bruce Davenport ..... Jamesville
H*Michael Reese Davis ..... Shelby
Octave Moseley Fletcher ..... Kinston
Beecher Hoyte Grose, Jr. ..... Harmony
H*George William Hofmann, Jr. ..... High Point
Sheila Ann Jordan ..... Siler City
Patricia Elizabeth Lanier ..... Richlands
Ector Reid Ledbetter ..... Shelby
Fred Allen Lemly ..... Fleetwood
*Carl Thomas Lippard, Jr. ..... Matthews
**Richard Arnold Long ..... Bergen, NY
Ruby Arlene Lynn ..... Durham
**John William McFadyen ..... Fayetteville
**Laura Jean Morrow ..... Charlotte
**Phillip Irvin Osborne ..... Greensboro
Ronald Kirpatrick Pickett, II ..... Chapel Hill
William Randall Robertson ..... Raleigh
Barbara Ann Scott ..... Lillington
Max Bailey Smith, Jr. ..... Siler City
H David Eric Spital ..... Greensboro
Beverly Allison Suggs ..... Charlotte
H*Randall Howard Sweeting ..... Brockport, NY
**Sara Saxby Sydnor ..... Durham
H**Roger Glenn Tessneer ..... Shelby
*Ricky Wayne Watts ..... Kannapolis
*Roy Hampton Watts, III ..... High Point
*William Andrew Wheeler ..... Lasker
Charles Wayne Whitfield ..... Timberlake
*Curtis Arnold Williamson ..... Henderson
*Bynum McKee Wood, Jr. ..... Statesville

Biological and Agricultural Engineering

Billy Worth Gilbert ..... Bolivia
Ronald Kimp Jones ..... Walnut Cove
Charles Ellis Martin ..... Eden
Frank Coleman Massey ..... Dudley
Robert Daniel Napier ..... Marshville
H*Ray Kearney Pleasant ..... Angier
Philip Wayne Price ..... Sharpesburg
Barry Eugene Shinn ..... Troutman
Thomas Alan Simmons ..... Yanceyville
Henry Clifton Sink, Jr. ..... Lexington
Dwain Reynolds Strader ..... Reidsville

Biological Sciences

Donna Lynn Burleson ..... Albemarle
Mary Elizabeth Callis ..... Raleigh
H*David Edward Faucette ..... Charlotte

* Honors ** High Honors H Honors Program

Janice Fambrough Fipps ..... Moncks Corner, SC
William Thomas Firth ..... Rocky Mount
Rebecca Rae Fortmeyer ..... Garner
Teresa Irene Goad ..... Winston-Salem
H*Stanley Charles Henry, Jr. ..... Waynesville
Karen Hester ..... Rocky Mount
**Diana Cook Hilliard ..... Raleigh
*Charles Jerry Jackson ..... Garner
Marshall Dean Keith, Jr. ..... High Point
H**Margaret Dow Moore ..... Virginia Beach, VA
H**Patricia Lee Nixon ..... Gates
*John Russell Peters ..... Norfolk, VA
David Darrell Pope ..... Beloeil, Quebec, Canada
Lloyd Lester Quay, Jr. ..... Harrisburg
*John Hall Reynolds ..... North East, MD
Mark Edward Rial ..... Aiken, SC
Jay Howard Sauber ..... Raleigh
H*Suzanne Marie Schaeffer ..... Rochester, NY
Ann Marsha Seligson ..... Raleigh
H**Stephanie Lee Sherman ..... Charlotte
John Bethel Strider, Jr. ..... Biscoe
H*Garnett Brooks Whitehurst ..... New Bern
*Donald Robert Whitley ..... North Wilkesboro
Lynda Legere Wyatt ..... Raleigh
Eva Ruth Zimmerman ..... Millville, NJ

Botany

H*Marilyn Lucille O. Deaver ..... Raleigh
Paul James Gross, Jr. ..... Spring Hope
H*Margaret Kay Kluttz ..... Salisbury
William Harvey Underwood ..... Cary

Food Science

*Dorothy Wehmeyer Bartholomay ..... Annandale, VA
Edwin Earl Bell ..... Apex
*Kathy C. P. Cheng ..... Raleigh
H*Sabra Carolyne DeVaun ..... Raleigh
*Audrey White Gilliland ..... Siler City
Roland Hayes Goldston, III ..... Wilson
Thomas Price Heritage, Jr. ..... Greensboro
*Robert Paul Hollar, Jr. ..... Wilson
Joseph Clarence Langley ..... Asheville
Deborah Bell Leverton ..... Whispering Pines
Sharon Cecille McEntire ..... Spindale
William Michael Mulchi ..... Norlina
Gerald G. Roney ..... Salisbury
H**William Roy Sanders ..... Charlotte

Horticultural Science

H*Toby Dale Bost ..... Winston-Salem
H Andrew Lee Brown ..... Baltimore, MD
Douglas Wade Carrigan ..... Mooresville

* Honors ** High Honors H Honors Program

Steve Martin Coble ..... Locust
*Paul William Corpening ..... Granite Falls
James Stewart Freeman ..... Salemburg
James Black Jones ..... Cape Charles, VA
John Lee King ..... Fayetteville
Craig Lee Leonard ..... Raleigh
*David Joe Massee ..... Elk Park
*Karen McCann ..... Greensboro
Lincoln Edward Morton ..... Raleigh
*Robert Alan Simmerman ..... Rockingham
Karan Dianne Simpson ..... Marshville
*Layne Karlton Snelling ..... Lexington
David Larry Spencer ..... Gastonia
Robert Steve Waddell ..... Wadesboro

Individualized Study Program

*Diane Elizabeth McLean ..... Statesville

Medical Technology

**Rebecca Jane Hawes ..... Cary
*Barbara Ann Marmor ..... Bethesda, MD
*Robbie Lynn Marsh ..... Raleigh
*Toni Lee Sugg ..... Snow Hill

Pest Management for Crop Protection

Henry Allen Wooten ..... Mapel Hill

Poultry Science

Emily Hall Benton ..... Roanoke Rapids
**Deborah Jean Beury ..... Southern Pines
H*Alan Jay Brodsky ..... Broomall, PA
Clarence Merrick Chenoweth, Jr. ..... Upperco, MD
Rebecca Jean Clapp ..... Marion
H**Roger Lewis James ..... Marshville
David Andrew Millns ..... New Bern
Barry Joe Orrell ..... Clemmons
Ronald Kirkpatrick Pickett, II ..... Chapel Hill
Donna Lou Shepherd ..... Durham
H David Eric Spital ..... Greensboro
*Bynum McKee Wood, Jr. ..... Statesville

Rural Sociology

Robert Bruce Howard Blanchard ..... Highland Park, NJ
Elizabeth Jeanne Martin ..... Shallotte

Soil Science

Timothy James Garrahan ..... Elmer, NJ

* Honors ** High Honors H Honors Program

**Jeffrey L. Specter ..... New York, NY
**Douglas J. Thomas ..... Newport, TN
George Norman White, Jr. ..... Plymouth

Wildlife Biology

H Nelson Maxie Ayers, Jr. ..... Raleigh
James Umstead Ennis ..... Red Oak
Thomas Lee Gilley ..... Jonesville
William Walter Gravley ..... Brevard
*Jacalyn Ann Hageman ..... Raleigh
John Rowland Hall ..... Fayetteville
**David William McGrew ..... Columbia, SC
H Douglas Keith Moody ..... Basking Hidge, NJ
Edward Dwight Taylor ..... Wilson
*Aubrey Eugene Vance, Jr. ..... Walkertown

Zoology

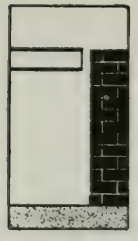
Robert Turner Bass ..... Seaboard
Susan Walker Bell ..... Walkertown
*Warren Joe Bell ..... Clinton
Christopher M. Bigalke ..... Columbia, SC
Edward Everette Blackwelder ..... Morehead City
Valerie Jean Blettner ..... New Bern
*Richard Benjamin Bradley, Jr. ..... South Boston, VA
*David Horton Brantley ..... Norlina
Carol Jean Bunge ..... Greensboro
Whit Dale Burnett ..... Gastonia
**Susan Lynn Butler ..... Sanford
H*William J. Buttery ..... Largo, FL
H*Mary Lucilla Campbell ..... Winston-Salem
Mary Freeman Carlton ..... Greensboro
Gregory Doy Cloud ..... Raleigh
H**William Hugh Craft, Jr. ..... Greensboro
H**Harris Bradford Craig, Jr. ..... Raleigh
H*Karen Leigh Davis ..... Hendersonville
H**Jennings Ray Dawkins, Jr. ..... Fayetteville
Michael Verloin deGruy ..... Mobile, AL
Melinda Lee Dellinger ..... Winston-Salem
Joan Marie DeMarco ..... Toms River, NJ
James Lester Duncan ..... Greensboro
Phil Michael Eddinger ..... Thomasville
Cynthia Ann Fischer ..... Fayetteville
Stanley Allan Fritts ..... Oak Ridge, TN
Vickie Lynn Fuquay ..... Carthage
Garland Page Gooch, Jr. ..... Raleigh
Paul Joseph Greene ..... Glen Alpine

* Honors ** High Honors H Honors Program

Tim O'Keefe Henrickson ..... Kannapolis
H*Christine Erickson Hunt ..... Raleigh
*Deborah Kay Johnson ..... Elkin
Laura Kathryn Kearns ..... Greensboro
H**Kent Howard Kistler ..... Raleigh
William David Leak ..... Garner
Myra Gaye Lentz ..... Salisbury
**Charles Ernest Loops, III ..... Greensboro
H*Michael Douglas Marshall ..... Rocky Mount
H*Robert Hugh Matheson, III ..... Silver Spring, MD
H*Kathleen Wallace McDonald ..... Raleigh
**Laura Jean Morrow ..... Charlotte
**Michael Edgar Newman ..... Charlotte
Abner Durham Potter ..... Asheboro
H*Richard Allen Price, Jr. ..... Norfolk, VA
*Ralph David Puckett ..... Oxford
H**Jerry Lee Punch ..... Newton
Eric Eugene Radabaugh ..... Swansboro
*Jerald Hughes Reynolds ..... Kenansville
Sandra Marie Rowland ..... Willow Springs
Edward Kimbrough Sammons ..... Charlotte
H*Takao Lewis Sato ..... Raleigh
Edward William Schiller ..... West Babylon, NY
*Karen Jeanne Sen ..... Alexandria, VA
H*Mark Odell Shambley ..... Durham
Charles McRae Sharpe ..... Kenansville
*Randolph Alonzo Sigley ..... Durham
Mary Carla Skeen ..... Millers Creek
*Michael Craig Sloan ..... Raleigh
**Suzanne Smith ..... Albuquerque, NM
H**Gail Marie Spellman ..... Kinston
H*Robert Mark Stiegel ..... Charlotte
Jerry Wayne Strickland ..... Bunn
*William Douglas Taylor ..... Port Arthur, TX
H Larry Felton Tilley ..... Raleigh
H*Robert Howard Underwood ..... Reidsville
*Aubrey Eugene Vance, Jr. ..... Walkertown
*Cynthia Ann Vatcher ..... Jacksonville
*Ricky Wayne Watts ..... Kannapolis
Deborah Carol Wiggins ..... Raleigh
David Donald Wilkinson ..... Fayetteville
H*Charles Michael Williams ..... Pine Ridge
**Harry Washington Wilson, III ..... Winston-Salem
William Glenn Winder ..... Winston-Salem
Larry Edward Wollett ..... Raleigh
**Mariana Ludmila Zeman ..... Cary

* Honors ** High Honors H Honors Program

School of Design



BACHELOR OF ENVIRONMENTAL DESIGN IN ARCHITECTURE

Gareth Bradley Beard ..... Newton
*Richard Marion Belk ..... Raleigh
Hezekiah Bradley, Jr. ..... Greensboro
**Timothy David Butler ..... Greensboro
*James Daniel Carroll ..... Raleigh
Richard Hugh Chandler ..... Charlotte
**David Michael Chreitzberg ..... Yardley, PA
Larry Frank Cook ..... Rural Hall
*Helen Holt Erwin ..... Spartanburg, SC
William Lenoir Faucette, Jr. ..... Charlotte
*Philip Goodwin Freelon ..... Reston, VA
Charles William Harris ..... Mount Gilead
*David Michael Hawes ..... Bolivia
*William Thomas Highsmith ..... Wilson
*James Gray Hite ..... Greenville
John Cogdell Hood, III ..... Kinston
*David Wallace Kay ..... Greensboro
Arthur Frederic Kennedy ..... Beulaville
*Robert Cordell Larson ..... Raleigh
Arne Thomas Laurene ..... Winston-Salem
*William Wagoner Lawrence ..... Tarboro
**Jeffrey Scott Lee ..... Hendersonville
Barry Lyerly Lumpkin ..... Salisbury
Leonard Richard Lyon, III ..... Durham
**Robert Mitchell Macon ..... Randleman
William Poole Mann ..... Greenville, SC
Robert William McDaniel ..... Durham
*William Galpin Monroe, III ..... Durham
*Wendy Carol Morrison ..... Durham
*William McDonald Parker ..... Raleigh
Steven Douglas Patton ..... Hickory
**Allen Dale Reaves ..... Raleigh
Lewis Cooper Riley ..... Raleigh
Martin Henry Schulken, III ..... Whiteville
**James Alexander Sink, Jr. ..... Chelmsford, MA
Louis Edward Skelton ..... Enka
William Frank Sliger ..... Moscow, ID

* Honors ** High Honors

Martin Coleman Smith ..... Charlotte
John Fredrick Stewart ..... Winston-Salem
*James Andrew Sykes ..... Greensboro
Philip Louis Szostak ..... Greensboro
*Rebecca Ann Talton ..... Smithfield
Andrew Steven Terrill ..... Southern Pines
*Frank Michael Tockes ..... Asheville
*Glenn Johnson Ware ..... Rye, NY
Errol Jordan Warren, Jr. ..... Rocky Mount
John Ferman Wilson, IV ..... Manteo
*Marshall Douglas Wilson ..... Pittsboro
Dennis Eugene Yates ..... Rockingham

BACHELOR OF ENVIRONMENTAL DESIGN IN LANDSCAPE ARCHITECTURE

Robert Everett Evans ..... Raleigh
*Stephen Kuhn ..... Sayville, NY
*William Campbell Lincicome ..... Parkersburg, WV
**George Judson Newbern, III ..... Ahoskie
*Frederick Gregory Proctor ..... Charlotte
Curtis Roberts Renz ..... Pittsburgh, PA
*Glenn Johnson Ware ..... Rye, NY

BACHELOR OF ENVIRONMENTAL DESIGN IN PRODUCT DESIGN

Douglas Philip Brotherton ..... Charlotte
Timothy Douglas Cathey ..... Lincolnton
Gregory Alden Culpepper ..... Charlotte
*Gloria Dawn Dickens ..... Roanoke Rapids
William Bernard Fallon ..... Ruxton, MD
Richard Cyril Ferguson, Jr. ..... Stanford, KY
Frederick Stratford Fonville ..... Burlington
Frank Lee Greathouse, II ..... Raleigh
**Laurie Jane Henry ..... Cambridge, MD
*Edwin Christy Jordan, Jr. ..... Wilmington
*Carl Thomas Lambeth ..... Raleigh
Larry Bruce Liles ..... Wendell
Peter John MacManus ..... Dublin, Ireland
Lisa Gale Milton ..... Black Mountain
**Leslie Dianne Mitchell ..... Lexington, KY
*Tony Lewis Pollard ..... Smithfield
*Sue Gatewood Randle ..... Raleigh
*Julia Elizabeth Rumbough ..... Hickory
*Robin Elizabeth Shaw ..... Raleigh
*Cathy Bea Frye Simmons ..... Raleigh
Lloyd Frederic Spaulding, Jr. ..... Marlboro, MA
**Nancy Lynn Summers ..... Canton, OH
*Mark Brady Templeton ..... Melville, NY
David Morgan Thompson ..... Gastonia

* Honors ** High Honors H Honors Program

School of Education

BACHELOR OF ARTS IN PSYCHOLOGY

Sandra Elizabeth Lee Anderson ..... Dunn
Candace Beth Appel ..... High Point
**Joanne Medlock Ashe ..... Concord
Lillie Bell Barber ..... Bayboro
Sheila Ann Barnes ..... Asheboro
Robin Whitehead Bradley ..... Rocky Mount
*Catherine Jean Bruns ..... Raleigh
Nancy Carol Cheatham ..... Durham
*Joanne Lois Conroy ..... Havelock
*Susan Jones Dietrich ..... Walstonburg
Marshall James Donathan, Jr. ..... Aberdeen
Sarah Esther Dougher ..... Raleigh
**Nadine Powell Downing ..... Columbia, SC
*Rena Marie Ferneyhough ..... Raleigh
Stuart Atwood Glover, III ..... Wilson
*Jane Elizabeth Grissom ..... Durham
Mary Elizabeth McGraw ..... Raleigh
*Sylvester Elliott McKay ..... Raleigh
William Robinson Moore, Jr. ..... West End
*Edwin David Munt ..... Winston-Salem
*Mary Jean Pate ..... Goldsboro
*Sandy Carter Pearce ..... Raleigh
*Janice Pratt Richardson ..... Eden
William Bruce Shingleton ..... Durham
Debra Sharon Stewart ..... Burlington
*Stephen Earl Sumerel ..... Asheville
*Donnie Ray Taylor ..... Raleigh
William Revere Wellborn, III ..... Morganton
**Pamela Jane Whitehorne ..... Portsmouth, VA
Gretchen Wilbur ..... Durham
*Sandra Elaine Womack ..... Lillington

BACHELOR OF SCIENCE IN EDUCATION

Agricultural Education

David Richard Gooden ..... Elizabethtown
*Simon Arthur Griffin ..... Williamston
Billy Hugh Hales ..... Zebulon

* Honors ** High Honors

David Ernest Harris ..... Wendell
Earl Dean Hollowell ..... Princeton
Jimmy Cline Huneycutt ..... Albemarle
Arthur Mack Jenkins ..... Potecasi
Terry Wayne Nance ..... Chadbourn
James Robert Pearce ..... Wendell
Roger Charles Sidden ..... Traphill
Alexander Dixon Tunnell ..... Swan Quarter
Robert Edwin Wheless, Jr. ..... Bunn
James Bryant Worley, Jr. ..... Princeton

Industrial Arts Education

*Barry Alan Anderson ..... Elkin
Charles Gregory Bagley ..... Williamston
Thomas William Bland, Jr. ..... Raleigh
William David Duncan ..... Burlington
Thomas Earl Knott ..... Fayetteville
Glenn Craig Kuszmaul ..... Leavittsburg, OH
Michael Dee Lanier ..... Wilson
David Emory Leland ..... Seattle, WA
Howard Moore Parrish, Jr. ..... Clayton
Edwin Sherwood Patterson, Jr. ..... Tarboro
Keith Neil Rich ..... Asheboro
Jackie Wade Russell ..... Denton
Gennie Lorraine Sorrell ..... Raleigh

Mathematics Education

Joan Carol Brittain ..... Kinston
Cynthia Ann Burt ..... Raleigh
**Barbara Jean Cary ..... Greensboro
*Martha Karen Deal ..... Rhodhiss
*Patricia Ann Finch ..... Fayetteville
*Vanise Bain Hardee ..... Lillington
Douglas Alan Harris ..... Smithfield
Wayne Eugene Holland ..... Boiling Springs
Vickie Thompson Ivey ..... Goldsboro
**Susan Lynn Krumroy ..... Raleigh
Donald Edward Lundy ..... Fayetteville
**Patricia Anita Petteway ..... Burlington
Kay Frances Powell ..... Kinston
Donna Marie Ricks ..... Durham
*Elizabeth Lynn Shook ..... Newport
**Zandra Kim Sledge ..... Jamestown
Susan Aileen Sneeden ..... Wilmington
*Susan Virginia Steagall ..... Rockingham
*Robin Ann Worley ..... Cerro Gordo

* Honors ** High Honors

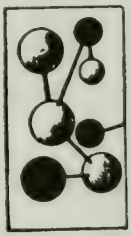
Science Education

Janet Lynn Bahor ..... Durham
Belinda Kay Baker ..... Danville, VA
Jon Marc Boyette ..... New Bern
Jacqueline Roberts Broyles ..... Asheville
Rebecca Rae Fortmeyer ..... Garner
Ralton Joyner Harris ..... Louisburg
Beverly Jean Moore ..... Winston-Salem
Ronald Lee Powell ..... Raleigh
*Nancy Christie Reeves ..... Raleigh
Ronnie Lynn Strickland ..... Wilmington
William Robinson Stringfellow, Jr. ..... Raleigh
*William Douglas Taylor ..... Durham
*Royce Phelps Weeks ..... Fuquay-Varina
Deborah Carol Wiggins ..... Raleigh

Vocational Industrial Education

Timothy Glen Bevacqua ..... Raleigh
Bernard Thomas Colbert ..... Pittsburgh, PA
*William Edward Covington, III ..... Fayetteville
Mitchell Angelo Guabelly ..... Raleigh
*Bradley Jay McDonald ..... Raleigh

School of Engineering



BACHELOR OF SCIENCE IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

Jointly administered by the School of Agriculture and Life Sciences and the School of Engineering.

Phillip David Cave ..... Dobson
Donnie Ray Ellis ..... Clinton
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Roland Hooks ..... Vanceboro
Warren Paul Jones ..... Wake Forest
Perry Darden Joyner, III ..... Goldsboro
*Richard Alan King ..... Matthews
Grover Adlai Martin ..... Summit, NJ
*Ruth Hunter Parker ..... Raleigh
*Konstantia Chris Pistolis ..... Raleigh
Michael Lynn Randolph ..... Marion
**Elizabeth Lee Simms ..... Raleigh
Donald Edwin Stewart, Jr. ..... Raleigh
*Billy Wayne Sutton ..... Greenville
Everett Ernest Taylor, Jr. ..... Raleigh
Richard Boyd Taylor ..... Kinston
Randall Brent Thomas ..... Louisburg
**Ernest Dean Trent ..... Liberty
Laurel Anne Vaughn ..... Greensboro
Glen Wheless Wall ..... Raleigh
Charles Alan Williams ..... Austin, TX
Gerry Baker Wolf ..... Durham

BACHELOR OF ARTS IN MULTI-DISCIPLINARY STUDIES

*Emmaline Vinson Aull ..... Raleigh
Barry Jay Greess ..... Raleigh
Luther Russell Herman, Jr. ..... Raleigh
*Anderson Hoyt Jackson, Jr. ..... St. Pauls
*Derek Innes Pocock ..... Raleigh
*David Bruce Sykes ..... Mebane

BACHELOR OF ARTS IN PHILOSOPHY

*Mark Fielding Darden ..... Balboa, Canal Zone
Michael Dean Johnson ..... Raleigh
Jein Paul ..... Raleigh
Garland Herbert Stout ..... Raleigh

BACHELOR OF ARTS IN POLITICS

Georgianna Virginia Baucom ..... Fayetteville
John Graham Bayless ..... Murphy
*Anneta Marcell Bunting ..... Durham
Earlene Atwood Carter ..... Broomfield, CO
*Lynne Keller Cauthen ..... Raleigh
*Shuji Shirasawa Corey ..... Williamston
Elna Earle Crittenden ..... Charlotte
Stephen Porter Davis ..... Beaufort
Anthony Lawrence Evans ..... Princeton

* Honors ** High Honors

*Patrice Henrika Fields ..... Raleigh
Bruce Keller Foulke ..... Perkasie, PA
David Alan Guth ..... Raleigh
Anne Hawes Harrison ..... Richmond, VA
**Dana Stafford Herring ..... Lexington
Karl Edward Knudsen ..... Raleigh
William Montelle Loyd, III ..... Raleigh
William Christopher Morgan ..... Raleigh
Priscilla Katherine Murphy ..... Atkinson
Joseph Turner Peebles ..... Burlington
Ronald Stanley Pierce ..... Zebulon
*John William Price, III ..... Jackson
Ralph John Rognstad, Jr. ..... Charlotte
*Shaye Marceil Ross ..... Silver Spring, MD
*Billy Wayne Sutton ..... Greenville
Joyce Tarantino ..... West Orange, NJ
David Spencer Thompson ..... Franklinton
*James Quimby Wallace, III ..... Morehead City
Owen Henry Willis, Jr. ..... Dunn

BACHELOR OF ARTS IN SOCIOLOGY

Thomas Winston Adkins ..... High Point
Sandra Faye Allen ..... Burlington
William Henry Allen ..... Boiling Springs
*Linda Moran Atkins ..... Eden
Cassandra Atkinson ..... Clayton
**Jean Elizabeth Aycock ..... Fayetteville
*Kathy Dean Bass ..... Rocky Mount
Joe David Biggerstaff ..... Hickory
**William Frank Bingham ..... Lexington
Ellen Marion Bissell ..... Greensboro
Patricia Jane Bulla ..... Asheboro
William Bradsher Cannady, Jr. ..... Oxford
*Betty Jackson Cantelli ..... Mount Olive
Jerry Michael Carroll ..... Durham
Ava Merle Cook ..... Sanford
David Sherrill Cooke ..... Tyner
John Nelson Crawford ..... Mebane
Martha Patton Crutchfield ..... Greensboro
Connis Raymond Dudley ..... Bayboro
Rebecca Elaine Ferrell ..... Angier
Charles Ware Fortune, Jr. ..... East Bend
Brent Blackmer Hedgpeth ..... Greensboro
*Eve Shartle Heizyk ..... Raleigh
Carol Ann Hoffman ..... Chambersburg, PA
Vicki Rowe Hollowell ..... Princeton
Andrew Thomas Howard ..... Oxford

* Honors ** High Honors

Vendetta Bush James ..... Raleigh
*Elizabeth Lynne Johnson ..... Cary
**Charlene Ruth Jordan ..... Raleigh
Emmett Dean Kemp, Jr. ..... Bartesville, OK
*Floyd Dale Kennedy ..... McLeansville
Kathie Thompson Knecht ..... Raleigh
Ann Drew Lane ..... Roanoke Rapids
*Anne Penney Little ..... Charlotte
**Jane Newton Longest ..... Salisbury
*Maryanne Martha Lowendick ..... Raleigh
Lucille Lewis Lynch ..... Hickory
Mary Karen Maughan ..... Raleigh
*Vickie Diane McCullen ..... Four Oaks
Alice Marie McLaughlin ..... Greensboro
Anne Rebecca Wilson McLaughlin ..... Hickory
*Galen Leah Meekins ..... Raleigh
Kathryn Ann Merritt ..... Clinton
*Allan Ray Miller ..... Knotts Island
Delma Laraine Mobley ..... Wilmington
*Edwin David Munt ..... Winston-Salem
Cynthia Belle Myatt ..... Asheboro
Frances Stoner Myers ..... Alexandria, VA
*Phyllis Karen Nance ..... Asheboro
Marjorie Sanborn Noyes ..... Marion
Brenda Rose O'Reilly ..... Kernersville
*Rebecca Rowland Powell ..... Fuquay-Varina
**Susie Ann Radford ..... Raleigh
**Karen Ann Savage ..... Swoyersville, PA
Edith Noreen Seykora ..... Greensboro
Carol Ann Simon ..... Monroe
Ronda Lynn Smith ..... Thomasville
Susan Katherine Stanton ..... Garner
**Sarah Baker Talley ..... Havelock
Monte Corwin Towe ..... Converse, IN
Richard Stanley Walker ..... Charlotte
Leroy Francis West, Jr. ..... Hamlet
*Margaret McKinney Williams ..... Lillington
Charles Roger Wilson ..... Tillson, NY
Maria Wegelin Wirth ..... Raleigh

BACHELOR OF ARTS IN SPANISH LANGUAGE AND LITERATURE

Gloria Aja ..... Raleigh
Jackie Marquetta Carringer ..... Murphy
Patricia Ellen Vester ..... Spring Hope

* Honors ** High Honors

BACHELOR OF ARTS IN SPEECH COMMUNICATION

*Dorothy Masters Beard ..... Coats
Deborah Leigh Bissette ..... Cary
Raymond Wallace Deltz, Jr. ..... Raleigh
James O'Dell Elmore, Jr. ..... Dunn
Kenneth Edward Hewett ..... Shallotte
Mark Lee Hitchcock ..... Raleigh
Robert Walton Holden ..... Greensboro
Ronnie Lee Jessup ..... Pilot Mountain
Michael William Jordan ..... Thurmont, MD
Joseph Edward Langley ..... Goldsboro
Timothy Alan Leith ..... Greenville
Dan Perry Robbins ..... Raleigh
William Augustus Rogers, Jr. ..... Wilmington
Sarah Virginia Sherrill ..... Raleigh
Robbie Lane Smith ..... Fuquay-Varina
Michael John Spera ..... Mt. Ephraim, NJ
*Gregory Earl Whitfield ..... Haw River

BACHELOR OF SCIENCE IN ECONOMICS

Harold Dean Bowker ..... Wrightsville Beach
Kay Hutchins Felker ..... Winston-Salem
**John Thomas Phillips, II ..... Norfolk, VA
David Loy Smith ..... Trinity
*Robert Dinkins Thomason ..... Charlotte
Gregory Paul Wolfe ..... Jamestown

BACHELOR OF SCIENCE IN POLITICS

*Lawrence Edwin Laubscher, Jr. ..... Silver Spring, MD

School of Physical and Mathematical Sciences

BACHELOR OF SCIENCE IN CHEMISTRY

*Victor Hugo Agreda ..... Raleigh
*Anita Sue Baker ..... Rocky Mount
*Samuel Woody Bass ..... Belmont

* Honors ** High Honors

Karl George Boldt ..... Pitman, NJ
*Kay Ellen Crawford ..... Danville, VA
*Otis Gwynn Durham, Jr. ..... Blanch
H**Nancy Bizzell Fleming ..... Charlotte
*Craig Stanway Hackett ..... Cleveland, OH
**Carolyn King Hart ..... Raleigh
Donna Lee Ingold ..... Carthage
*John Arthur Lea ..... Philadelphia, PA
H**William Lynwood McCullen ..... Rocky Mount
Patricia Ella Mullins ..... Jacksonville
*Clyde Douglas Peedin, Jr. ..... Halifax
John Russell Peters ..... Norfolk, VA
*Pamela Martin Pittman ..... Fairmont
**Wayne Kimberly Ruth ..... Raleigh
H**William Lee Stewart ..... Concord
Monte Lynn Wall ..... Lenoir
*Somkiat Wongsirikul ..... Bangkok, Thailand

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

H**William Louis Albert ..... Elizabeth City
Lenard Carl Bailey ..... Stokesdale
Thomas Charles Bailey ..... Stokesdale
John William Beaver ..... Charlotte
*Michael Alan Belch ..... Newport, RI
Leavy Allen Bennett, Jr. ..... Wilmington
H**William Thomas Blanchard ..... Raleigh
Gerald Robert Brown ..... Villas, NJ
Lewis Anderson Carson, Jr. ..... Kingsport, TN
H**Joette Marie Davis ..... Concord
Michael Di Cicco ..... Lexington, MA
*Stephen Merrell Diering ..... Raleigh
H**Albert Mark Edwards ..... Mount Olive
*Marie Camille Garneau ..... Northglenn, CO
*Rebecca Lee Glasgow ..... Greensboro
H**Frankie Jo Goodson ..... Matthews
**Suzanne Saunders Gordon ..... Winston-Salem
Robin Anne Hill ..... Winston-Salem
**Michael Louis Holder ..... Raleigh
*Harold Kenneth Hutchinson ..... Athol, MA
*Robert Brooks Johnson ..... Winston-Salem
Arthur Lynwood Jones ..... Charlotte
Stephen Whitley Jones ..... Greenville
*Michael Luther Kiser, III ..... Greensboro
Timothy Karl Kvanvig ..... Raleigh
Lawrence Marshburne, Jr. ..... Dunn
Timothy Michael McGehee ..... Greensboro
*Wade Hampton McInnis, III ..... High Point
Robert Stephen Nix ..... Canton
William Leon Nordan ..... Angier
Carroll Gray Perkins ..... Pilot Mountain

* Honors ** High Honors H Honors Program

*Joseph Thomas Pittman ..... Wilson
Dennis Lynn Price ..... Belmont
Alan Lee Stewart ..... Raleigh
James Edward Sullivan ..... Wilson
Thomas Whitmel Urquhart ..... Raleigh
*Gregory Gordon Wallace ..... Havelock
Robert Ellis Williams, Jr. ..... Tomahawk
Michael Paul Wood ..... Greenville, SC

BACHELOR OF ARTS IN GEOLOGY

Michael Dee Lanier ..... Wilson
*Katherine Hine Tew ..... Raleigh
Walter Rand Turner, Jr. ..... Clayton
Robert Richard Workman, Jr. ..... Matthews

BACHELOR OF SCIENCE IN GEOLOGY

Terry Michael Brown ..... West Jefferson
Everett Lacy Coates ..... Clayton
*Lee Glaser ..... Virginia Beach, VA

BACHELOR OF SCIENCE IN MATHEMATICS

H**Donald Walter Amann ..... Charlotte
*Martha Karen Deal ..... Rhodhiss
**Christy Lynn Dekle ..... Kinston
**Susan Jane Dellinger ..... Hickory
Donna Allen Dickinson ..... Farmville
Judy Ann Di Giacomo ..... East Brunswick, NJ
H**Glenn Allen Evans ..... Youngsville
*Patricia Ann Finch ..... Fayetteville
H**Suzanne Saunders Gordon ..... Winston-Salem
*Vanise Bain Hardee ..... Lillington
*Donal Haun Henry, Jr. ..... Burlington
**Michael Louis Holder ..... Raleigh
Edward Earl Johnson ..... Dunn
Mary Elizabeth Johnson ..... Wendell
*Robert Brooks Johnson ..... Winston-Salem
*Judy Kendall Kittleson ..... Norwood
**Susan Lynn Krumroy ..... Raleigh
**Andrew Joel Lebold ..... Charlotte
*Mary Elizabeth Little ..... Charlotte
*Teri Louise Louden ..... Fayetteville
*Donald Arthur Lovell ..... Silver Spring, MD
Donna Marie Ricks ..... Durham
H**Michael Stephen Shipman ..... Hendersonville
**Zandra Kim Sledge ..... Jamestown

* Honors ** High Honors H Honors Program

Joyce Elaine Stegall ..... Salisbury
Debra Ann Tarlton ..... Concord
*William Jennings Terrell ..... Charlotte
Diane Marie Tetreault ..... Jamestown
Janice Kay Walker ..... Washington
Katherine Ellen White ..... Wilson
George Campbell Wilson, Jr. ..... Belmont
William Miller Wilson ..... Nashville

BACHELOR OF SCIENCE IN PHYSICS

*Albert George Beyerle, Jr. ..... Annapolis, MD
H**Charles Edwin Burris ..... Raleigh
Mark Frederick Desrosiers ..... Butner
H**William Starnes Freeman, Jr. ..... Charlotte
Roderick Andrew Gilmore ..... Verona, NJ
*Robert Henry Jackson, Jr. ..... Charlotte
**Edwin Dillard Mantiply ..... Charlotte
William David McGuinn, Jr. ..... Asheville
H**Kenneth Boyd Sales ..... Burlington
**John Rudolph Smith ..... East Rockingham
William Johnston Starnes ..... Raleigh

BACHELOR OF SCIENCE IN STATISTICS

*Susan Smith Casada ..... Charlotte
**Al Nelson Hawks, Jr. ..... Mount Airy
**Asa Moye Manning, Jr. ..... Raleigh
Paul L. Marsh ..... Cary
*Carl Alexander Mills, III ..... Cary
*Randolph Norwood Vance ..... Winston-Salem

School of Textiles

BACHELOR OF SCIENCE IN TEXTILE CHEMISTRY

Sushil Bhalchandra Ajgaonkar ..... Philadelphia, PA
*Andrell Donald Allen, Jr. ..... Shelby
Pamela Jane Arthurs ..... Pittsboro
James Kenneth Beck ..... Spencer
Thomas Neil Chadwick ..... Burlington
Donald Lee Chambers ..... Graham
**Leland Grant Close, Jr. ..... Asheville
**John Walton Duncan, Jr. ..... Charlotte
James Peyton Ennis ..... Raleigh

* Honors ** High Honors H Honors Program

*Oscar Kai Chi Hsu ..... Hong Kong
Elizabeth Ann Humphries ..... Winston-Salem
Amit Sevantilal Jhaveri ..... Bombay, India
Clyde Sabiston Keller ..... Chimney Rock
*Ronald Lee King ..... Yanceyville
*Robert Paul Lambert ..... Goldsboro
*Daniel Laporte ..... Labelle, Quebec, Canada
James Langdon McCormick ..... Fairmont
*Donna Garren Miller ..... Brevard
Houston Hardin Polson ..... Iron Station
Nigel Retchless ..... Magog, Quebec, Canada
*Sherman Harold Sheppard ..... Pilot Mountain
*Cynthia Karen Sokol ..... Raleigh
Robert Franklin Willis ..... Fair Bluff
*William Daniel Wilson ..... Cornwall, Ontario, Canada
*Somkiat Wongsirikul ..... Bangkok, Thailand

BACHELOR OF SCIENCE IN TEXTILE TECHNOLOGY

Charles Stephen Acker ..... Southern Pines
*Andrell Donald Allen, Jr. ..... Shelby
Danny Hubert Allen ..... Four Oaks
Byron Lee Annas ..... Hudson
*Janice Marie Artis ..... Four Oaks
James Kenneth Beck ..... Spencer
Itha Martin Best ..... Dunn
*Carl Lee Bost ..... Hickory
Ray Earl Bostian ..... China Grove
*Dennis Ray Bowman ..... Hickory
William Horace Boyette, Jr. ..... Wilson
Marie Royster Davis ..... Roxboro
**Ann Elizabeth de Pelham ..... Hamilton, Ontario, Canada
**Clovis Goncalves de Sousa, Jr. ..... Belo Horizonte, Minas Gerais, Brazil
Charles Alan Donaldson ..... Mt. Mourne
*Sheryl Ann Eckroth ..... North Brunswick, NJ
Kemp Hannon Edwards ..... Castalia
*William Edward Garner ..... High Falls
*Jack Harvey Garrison, Jr. ..... Gastonia
**James Kimpton Gillin ..... Listowel, Ontario, Canada
*William Grover Godwin ..... Kenly
Donald Seth Goldman ..... Dallas, TX
John Godfrey Gravlee, III ..... Raleigh
Charles Stanley Greene ..... Concord
*Michael Emmett Hamlin ..... Hendersonville
*Randy Lee Harriss ..... Elizabethtown
*Gary Alan Hefner ..... Hickory
Darrell Everett Hewett ..... New London
Ricky Lee Holland ..... Belews Creek
**James Franklin Hord, Jr. ..... Shelby
John Ed Horne ..... Wilson
Elizabeth Ann Humphries ..... Winston-Salem
**Nicholas Edward Irwin ..... Sparta

* Honors ** High Honors

Don Ray Jackson ..... La Grange
Kerry Eatmon Jackson ..... Kenly
Harvey Augustus Jeffreys, III ..... Burlington
**Francois Lapierre ..... Brossard, Quebec, Canada
Billy Dean Lassister ..... Smithfield
*Ronald Earle Laughlin ..... Gastonia
Carolyn May Lawrence ..... Lexington
Alan Guok-Ann Lee ..... Singapore
*James Barry Leonard ..... Raleigh
Charles Jackson Lyerly ..... Spencer
Charles Stephen Mangum ..... Williamston
Philip Wesley Massengale ..... Nashville
**Wayne Charles Matchen ..... Burlington, Ontario, Canada
*Ricky Lynn McBride ..... Salisbury
*William Steve McPeters ..... Asheville
**Dixon Stanley Medlin ..... Pine Level
James Wilson Melvin, Jr. ..... Lumberton
*Pamela Jean Mewborn ..... Charlotte
Joseph Robert Michael ..... Burlington
*Terry Gray Montgomery ..... Raleigh
Haynes Carpenter Murdoch ..... Salisbury
Maureen Michelle Murphy ..... Smithtown, NY
Dwight Larue Payne ..... Snow Camp
Thomas Page Perkinson, Jr. ..... Wise
David Ladd Perry ..... Burlington
*Donald Burl Philyaw ..... Winston-Salem
**Claude Pinnix, Jr. ..... Elkin
David William Poovey ..... Hickory
*Arnold Keith Price ..... Selma
John Arthur Redding, Jr. ..... Lewisville
*Robert Henry Ritchie ..... Raleigh
**Charles Preyer Roberts, III ..... Shelby
Carlton Rudolph Rozier ..... Greenville, SC
*Benton Everette Scarboro, Jr. ..... Mount Gilead
*Gary Thomas Starr ..... Lexington
Eric Michael Stoneman ..... Greensboro
Robert Alexander Stowe, Jr. ..... Barnesville, GA
Terry Martin Summers ..... Mocksville
*Boonchai Tanyavutti ..... Bangkok, Thailand
Derek Lester Taylor ..... Williamston
Terry Vernon Tysinger ..... Lexington
William Austin Waters, Jr. ..... Grifton
*Nancy Wilson Webster ..... Mebane
John Robert White ..... Gastonia
Donald Smallwood Wimbrow, II ..... Norlina
Robert Lee Young, Jr. ..... Fayetteville

* Honors ** High Honors

Professional Degrees

CIVIL ENGINEER

Walter Dean Cunningham ..... Asheville
Frank Paul Palmieri ..... Crossnore

ELECTRICAL ENGINEER

Fred Norman Tharpe ..... Ronda
Allen Russell Wooten ..... Lexington
Azizullah Zeerak ..... Kabul, Afghanistan

MECHANICAL ENGINEER

Rick Alan Dayton ..... Asheville
Ashok Kumar Jain ..... Barnala, Punjab, India
Chester Brent Litwin ..... Thomasville

DEGREES CONFERRED

Master's Degrees

May 17, 1975

MASTER OF AGRICULTURE

Saad Mohammad Ahdaya ..... Tripoli, Libya
Michael Oliver Fleming ..... Ahoskie
Harry Michael Linker ..... Raleigh
David Neal Sinodis ..... Fayetteville
Orapin Thirawat ..... Bangkok, Thailand

MASTER OF ARCHITECTURE

Larry Eugene Austin ..... Asheboro
Chaturong Chaisupranond ..... Bangkok, Thailand
Adbul Shakoor Farhadi ..... Kabul, Afghanistan
Kerry Alan Kane ..... Raleigh
John Paul Lucas ..... Raleigh
Lee Norman Mehler ..... Greensboro
William Michael Peery ..... Catawba
Michael Kent Schley ..... Cleveland, OH
John Edward Thomasson ..... Louisville, KY
Robert Graham Webster ..... Wilmington

MASTER OF CHEMICAL ENGINEERING

James Alexander McCarthy ..... Durham
Vishnubhai Ambalal Patel ..... Baroda, Gujarat, India
Benjamin Sy Santos ..... Youngstown, OH

MASTER OF CIVIL ENGINEERING

William Herbert Bland, Jr. ..... Cary
Conrad Bradsher Ehrhardt ..... Pinehurst
Joseph Sherrill Hill, Jr. ..... Marshville
Michael David Holveck ..... Raleigh
Allen Lee Hurlocker ..... Wilmington
Edison Hubert Johnson, Jr. ..... Durham
Keith White Little ..... Fayetteville
Herbert Pope McKim, Jr. ..... Raleigh
Donald Rives Morton ..... Raleigh
Michael Onyekwere Ndukuba ..... Umuobiala, Nigeria

Vernon Edward New ..... Fayetteville
Dennis Ray Ramsey ..... Morganton
Scott Lamar Seritt ..... Dalton, GA
Patricia Ann Spaine ..... Raleigh
William Harold Taylor, Jr. ..... Louisburg
Michael Jeffrey Wallis ..... Arlington, VA
Stephen Kenyon Worrell ..... Roanoke, VA

MASTER OF ECONOMICS

Sidney Edwin Bostian, Jr. ..... Hickory
Bora Gurer ..... Ankara, Turkey
Richard John Johnson ..... Charlotte
Banks Clifton Kelly, III ..... Durham
David Wayne McLamb ..... Benson
Nelson Jacob Updaw ..... Rochester, NY
Ricaurte Vasquez ..... Panama, Panama
Mellie LaRoche Warner ..... Clemson, SC
Sarun Wattanutchariya ..... Bangkok, Thailand
James Henry Wheeler, Jr. ..... Henderson
Fred Eugene Williams ..... Midland
Luis Ruben Zavaleta-Remy ..... Lima, Peru

MASTER OF EDUCATION

Adult and Community College Education

Linda Bunch Best ..... Taylorsville
Sherman Rex Bissette ..... Roanoke Rapids
Willie Jasper Carter ..... Fayetteville
Ann Vaughn Clark ..... Fayetteville
Frank Wiley DeLong, III ..... Fayetteville
Gloria Stephenson Dupree ..... Willow Springs
Stephen Hopkins Franke ..... Fayetteville
David Castello Hoyle ..... Henderson
Elizabeth Womble Jones ..... Snow Hill
James Bruce MacGregor ..... Chicago, IL
Nancy Garner Moseley ..... Roanoke Rapids
Elizabeth Thorndyke Nye ..... Lumberton
Lechi Tran Oggeri ..... Hanoi, North Vietnam
Louis Walton Ollie ..... Fort Bragg
Robert Lee Ostrand ..... Des Moines, Iowa
Anna Cooper Painter ..... Durham
Richard David Patton, III ..... Fort Bragg
James Michael Pitman ..... Shelby
James Hughie Ray, Jr. ..... Sylva
Philip Neill Reed ..... Fayetteville
Shirley James Sheares ..... Clayton
Emil Michael Shutak ..... Peckville, PA
Warren Stanley Smith ..... Fayetteville
Brenda Lou Steele ..... Burlington, VT
John Gary Warren ..... Tarboro
Marvin Wells ..... Middleton, OH
Gordon Lee Williams ..... Williamston

Agricultural Education

Jerry Gill Davis ..... Waxhaw

Guidance and Personnel Services

Kathryn Parlett Armstrong ..... Hope Mills
Kathy Sophia Barrier ..... Concord
Lynda Pell Creed ..... Dunn
Dianne Dailey ..... Frankfort, KY
Lessie Gibbs Doughty ..... Raleigh
Donna Ruth Ferguson ..... Charleston, WV
Mattie Thompson Goode ..... Riviera Beach, FL
Loula Pittman Stewart ..... Whiteville
Robert Mershon Stone ..... Southern Pines

Industrial Arts Education

Tanita Dharmajiva ..... Bangkok, Thailand
Harold Walter Haun ..... Raleigh
Patrick Lee Pope ..... Raleigh

Mathematics Education

Joyce Hatch ..... Mount Olive

Special Education

Teel Dunn Padgett ..... Raleigh
Susan Harless VanDeVeer ..... Raleigh

Vocational Industrial Education

James Wesley Dossett ..... Newport News, VA
Julia Raye Mobley ..... Hobucken
Russell Rankin, Jr. ..... Greensboro

MASTER OF INDUSTRIAL ENGINEERING

Clayton Eugene Bunyard ..... Burlington
Donald Ray Freezell ..... Maryville, TN
Stephen Conway Lewis ..... Mechanicsville, VA
Donald Lynn Milligan ..... Burlington

MASTER OF LANDSCAPE ARCHITECTURE

Taimi Toffer Anderson ..... Durham
Stephen James Biasini ..... South Bend, IN
Sheridan James Bunnell ..... Lake Oswego, OR
David Michael Gaines ..... Brookline, MA
Susan Merle Goltsman ..... Greensboro
Robert Patrick Gomez ..... Norfolk, VA
Marjorie Whitall Hackmann ..... Raleigh
William Coleman Long, II ..... Burlington
Larry Christopher Morgan ..... New York, NY
Marion MacKaye Ober ..... New York, NY
Steven Hyrum Plewe ..... Salt Lake City, Utah
Bonnie Ruth Simms ..... Cary

MASTER OF LIFE SCIENCES

Linda Wyrick Key ..... Burlington
Donald Owen McInnis ..... Raleigh
William Dula Tuttle, Jr. ..... Maiden
Margaret Ruth Whittaker ..... Raleigh

MASTER OF MECHANICAL ENGINEERING

Curesh Dallalzadeh ..... Sanandaj, Iran
Pradipkumar Savailal Patel ..... Irvington, NJ
Massoud Poursalimi ..... Tehran, Iran
Pankajkumar Natwarlal Shah ..... Devgad Baria, Gujarat, India
William Holt Sutton ..... Rocky Mount

MASTER OF PRODUCT DESIGN

Linda Ruth Emslie ..... Durham
John Harrill McBrayer ..... Shelby
William James Rathbun ..... Raleigh
Catherine Christie Rucker ..... Greensboro
Lawrence Daniel Tracy ..... Chapel Hill

MASTER OF PUBLIC AFFAIRS

Samuel Kpakpo Allotey-Jordan ..... Accra, Ghana
Calvin Wayne Colyer ..... Hope Mills
Sidney Ford Cooper, Jr. ..... Montgomery, WV
Patricia Wilson Crotts ..... Raleigh
Edith Naylor Eastman ..... Durham
John Brinkley Finch ..... Belmont
William Glenn Gainey ..... Maxton
Robert D. Jassem ..... Fort Bragg
Aito Juhani Kervuori ..... Raleigh
George Ofoe Kugblenu ..... Accra, Ghana
Lawrence Grant Lupus ..... Pennsauken, NJ
Joe Robert Morgan, Jr. ..... New London
Gary Eugene Parker ..... Raleigh
David Olive Stephens ..... Fuquay-Varina
Thomas Ray Ward ..... Burlington

MASTER OF RECREATION RESOURCES

Bruce Elvin Clapp ..... Whitsett

MASTER OF SOCIOLOGY

John Freeman Damon ..... Tamworthy, NH
Mongkol Darnsirichaisavad ..... Khon Kaen, Thailand
Herbert Wallace Kress ..... Cary

MASTER OF STATISTICS

Janet Lee Hauser ..... Media, Pennsylvania
Jacqueline Edwina Kent ..... Cincinnati, OH
Hector Segundo Paredes ..... Caracas, Venezuela
Jack Caviness Suggs ..... Cary

MASTER OF TECHNOLOGY FOR INTERNATIONAL DEVELOPMENT

Joseph Stanley LeGath ..... El Paso, TX
Arthur Lee Llorca ..... Fayetteville

MASTER OF TEXTILE TECHNOLOGY

Joseph William Kernodle ..... Reidsville

MASTER OF URBAN DESIGN

Douglass Rolla Gamble ..... Medford, NJ

MASTER OF ARTS

English

Robert McMaster Butler ..... Raleigh
Maliha Farhadi ..... Kabul, Afghanistan
Chadwick Buford Hilton, Jr. ..... Winston-Salem
Susan Neal Mayberry ..... Winston-Salem
Kathy Booth Stewart ..... Mt. Pleasant, SC

MASTER OF SCIENCE

Agricultural Economics

Maceo Leonard ..... Marion, SC

Animal Science

Lucy Ray Brannen ..... Atlanta, GA
*Harvey Lee Leary, Jr. ..... Durham

Applied Mathematics

Michael Roy Boroughs ..... Asheboro
Robert Eric Brofft ..... Blanco, TX
Stephen Tyler Corbin ..... Roanoke, VA
John Clark Hedges ..... Denison, KS
Wanda Ethel Dian McNair ..... Laurinburg
Archie Henry Muse ..... Carthage
Lynwood McDonald Tharrington ..... Henderson
Gerald Frank Wyngaard ..... Kimberly, Wisconsin

Biological and Agricultural Engineering

Abdolkarim Behnia ..... Ahwaz, Iran
James Blair Phillips ..... Bridgeton

Chemical Engineering

Chen-Chi Ma ..... Tainan, Taiwan
Lanny Calvin Treece ..... Concord

Chemistry

John Edgar Neal ..... Benson

* Co-major in Microbiology. See page 51.

Civil Engineering

Larry Richard Goode ..... Raleigh

Crop Science

Dennis Jay Osborne ..... Waynesville

Electrical Engineering

William Joseph Curry ..... Raleigh
Jay Jeffrey Hoffacker ..... Cranford, NJ
David Alan Rabenhorst ..... Silver Springs, MD

Engineering Science and Mechanics

Tony Wayne Sigmon ..... Hickory

Entomology

William Paul Barney ..... Bath, NY
Timothy Webster Hunt ..... Henderson

Forestry

Terence Rhett Fitz-Simons ..... Chapel Hill
Isara Vongkaluang ..... Bangkok, Thailand

Geology

Sharon E. Lewis ..... Raleigh

Horticultural Science

Alan Scott Grayson ..... Atlanta, GA

Marine Sciences

Alan Michael Chambers ..... Jacksonville
William Dennis Hart ..... Milwaukee, WI
Jon Paul Kahler ..... Beaver Creek, MN
Jerome Kohl ..... Raleigh
Robert Balfour Woodson, Jr. ..... Raleigh

Materials Engineering

Johnny McGrady ..... North Wilkesboro
Harry Adams Taylor ..... Wilmington

Mathematics

Elizabeth Anne Buie ..... Raleigh
Michael Werner Stadelmaier ..... Raleigh
Daniel Earl Suman ..... Williston, SC
Man-Yuen Wong ..... Hong Kong

Mechanical Engineering

John Estes Conway ..... Asheville
Allen Craig Eberhardt ..... Raleigh
Martin Ralph Lajczok ..... Hartford, CT
Harsh Vardhan Nayyar ..... New Delhi, India

Microbiology

*Harvey Lee Leary, Jr. ..... Durham
Jimmy Ray Pounds ..... Raleigh

Physics

Robert Lee Holden ..... Charleston, SC

Plant Pathology

Tran Thi Le Chi ..... Saigon, South Vietnam

Psychology

Susan Gayle Neeley ..... Raeford

Recreation Resources Administration

Clyde Eugene Chesney ..... Fayetteville
Beth Evelyn Wilson ..... Angier

Rural Sociology

Thomas Philip Coyne ..... Fayetteville

Soil Science

Alfredo Scheid Lopes ..... Minduri, Brazil
Sharon Gibson Sanderford ..... Clayton

Textile Chemistry

George Douglas Chambers ..... Valleyfield, Quebec, Canada

Textile Technology

Niranjan Madhuvandas Desai ..... Hamilton, Ontario, Canada
Shu Chun Pang ..... Raleigh

Zoology

Barbara Hartley Grimes ..... Morehead City
Joseph McMurray Hester, Jr. ..... Wilson
Linda Faye Lach ..... Rushland, PA
Harvey Hoffman Stuart ..... Fort Collins, Colorado
William H. Tarplee, Jr. ..... Garner

* Co-major in Animal Science. See page 49.

Doctor of Education Degrees

Kincheon Hubert Bailey, Jr., Occupational Education
Raleigh, North Carolina
Dissertation: A Study to Determine the Effectiveness of Selected Engineering Technology Curricula in Meeting the Requirements of Graduates, Educators, and Industry. (Under the direction of Durwin M. Hanson).

David Horton Bland, Adult and Community College Education
Raleigh, North Carolina
Dissertation: An Exploration of the Perceptions Held by Selected Vocational Education Administrators in Michigan Concerning Their Present Management Information Systems. (Under the direction of Isaac E. Ready).

Joseph F. Brooks, Jr., Adult and Community College Education
Cary, North Carolina
Dissertation: Organizational Linkage Between the North Carolina Agricultural Extension Service and Selected Other Agencies. (Under the direction of James D. George and Edgar J. Boone).

James Howard Camp, Adult and Community College Education
Raleigh, North Carolina
Dissertation: An Analysis of Leader Behavior Attitudes of Adult Basic Education Directors in the North Carolina Community College System. (Under the direction of Edgar J. Boone and Glenn C. McCann).

Claude Richard Canup, Jr., Occupational Education
Anderson, South Carolina
Dissertation: A Study of the Competencies Needed by Chief Administrators of Public, Two-year, Post-secondary Educational Institutions as Perceived by Local Chief Administrators Within the South Carolina System of Technical Education. (Under the direction of Texton R. Miller).

David Eson Daniel, Adult and Community College Education
Louisburg, North Carolina
Dissertation: Value Orientations Toward Education of Students in the North Carolina Community College System: An Analysis. (Under the direction of J. Conrad Glass, Jr. and Ronald W. Shearon).

Vivien King Ely, Occupational Education
Richmond, Virginia
Dissertation: Collaboration for Planned Organizational Change in a State Vocational Education Agency (SVEA). (Under the direction of John K. Coster).

Clyde Atkinson Erwin, Jr., Adult and Community College Education
Goldsboro, North Carolina
Dissertation: Beliefs Held by 1973 North Carolina Legislators Regarding Selected Micro Concepts Germane to the North Carolina Community College System. (Under the direction of Edgar J. Boone).

Richard Francis Harshberger, Adult and Community College Education
Johnstown, Pennsylvania
Dissertation: Job Satisfaction/Dissatisfaction and the Motivation to Work of Full-Time University Teaching Faculty: An Analysis. (Under the direction of Edgar J. Boone).

Donald Avery Hart, Adult and Community College Education
Lenoir, North Carolina
Dissertation: A Comparison of Attitudes of Employees Toward Two Types of Performance Evaluation. (Under the direction of William L. Gragg).

G. William Porter, Occupational Education
Damariscotta, Maine
Dissertation: Development and Demonstration of an Inductive Method of Health Education Needs Assessment in a Geographic Area of North Carolina. (Under the direction of John K. Coster).

William Cecil Walters, Occupational Education
Lancaster, South Carolina
Dissertation: A Study of Procedures Identified as Relevant in Effecting Program Articulation Between Secondary Vocational Centers and Postsecondary Technical Education Centers in South Carolina. (Under the direction of Durwin M. Hanson).

Carl A. York, Industrial Arts Education
Bensenville, Illinois
Dissertation: Response to Technology: Implications for Industrial Arts Teacher Education Drawn from the Harvard Programs on Technology and Society. (Under the direction of Delmar W. Olson).

Doctor of Philosophy Degrees

Agaram Subramanian Abhiraman, Fiber and Polymer Science
Madras, India
Dissertation: Flow of Certain Classes of Anisotropic Fluids Through Extrusion Type Geometries. (Under the direction of T. Waller George).

Meena Pratulkumar Ajmera, Physics
Calcutta, India
Dissertation: A Simplified Multichannel Variational Method for Atomic Scattering Calculations. (Under the direction of Kwong T. Chung).

Pratul Kumar Ajmera, Electrical Engineering
Calcutta, West Bengal, India
Dissertation: Electrical and Optical Studies of Ion Implanted Infrared Sensor Diodes in Epitaxially Grown $(Ga_xIn_{1-x})As$. (Under the direction of John R. Hauser).

Sarah Gilbert Allen, Chemical Engineering
Washington, North Carolina
Dissertation: Fixed Gas Transport Through a Series of Vinyl Polymers. (Under the direction of Vivian T. Stannett).

Allen Joseph Barwick, Industrial Engineering
Grifton, North Carolina
Dissertation: The Use of Mathematical Programming for Improving Resource Allocation in Higher Education Systems. (Under the direction of Robert W. Llewellyn and Michael J. Magazine).

William John Cameron, Civil Engineering
Raleigh, North Carolina
Dissertation: The Development and Application of a Methodology to Assess Selected Regional Transportation Characteristics: Study of Intercity Public Transit Potential in the Piedmont Crescent of North Carolina. (Under the direction of Clinton L. Heimbach).

Carl Edward Cerniglia, Microbiology
Poughkeepsie, New York
Dissertation: Oxidation and Assimilation of Hydrocarbons by Microorganisms Isolated from the Marine Environment. (Under the direction of Jerome J. Perry).

I-Hsiun Chen, Physics
Raleigh, North Carolina

Dissertation: ^1P Autoionization States in He in the Elastic Scattering Region. (Under the direction of Kwong T. Chung).

Harold Kenneth Cordell, Economics and Forestry
Raleigh, North Carolina

Dissertation: Substitution Between Privately and Collectively Supplied Urban Recreational Open Space. (Under the direction of David N. Hyman and Joe O. Lammi).

Michael Charles Cullingford, Nuclear Engineering
Olney, Maryland

Dissertation: Combined Radiative and Convective Heat Transfer to Laminar Flow in a Flat Conduit. (Under the direction of M. Necati Ozisik).

Terry Smith Dunn, Physics
Raleigh, North Carolina

Dissertation: Development of Two Radiotracer Principles for Measuring Laminar Flow Rate and Channel Volume as in Venous Blood Flows. (Under the direction of Robin P. Gardner and Arthur W. Waltner).

Jeffrey Ford Eastman, Electrical Engineering
Stanford, California

Dissertation: An N-Space Model for Visual and Verbal Concepts. (Under the direction of John Staudhammer).

Edward Walker Gregory, Engineering Science and Mechanics
Raleigh, North Carolina

Dissertation: The Optimum Pocket Geometry for a Finite Hydrodynamic Thrust Bearing. (Under the direction of Clarence J. Maday).

Edwin Wilbur Hauser, Civil Engineering
Raleigh, North Carolina

Dissertation: The Evaluation of Transportation Programs for the Rural Disadvantaged. (Under the direction of Paul D. Cribbins).

Thomas O. Holtzer, Entomology
Raleigh, North Carolina

Dissertation: Factors Affecting the Time Required for Emergence of Diapausing *Heliothis zea* (Boddie) (Lepidoptera: Noctuidae). (Under the direction of J. R. Bradley, Jr. and Robert L. Rabb).

Robert Ward Johnson, Marine Sciences
Hampton, Virginia
Dissertation: A Simulation Model for Studying Effects of Pollution and Freshwater Inflow on Secondary Productivity in an Ecosystem. (Under the direction of B. J. Copeland and G. E. Bennington).

James W. Jones, Biological and Agricultural Engineering
Starkville, Mississippi
Dissertation: A Simulation Model of Boll Weevil Population Dynamics as Influenced by the Cotton Crop Status. (Under the direction of Henry D. Bowen and Robert S. Sowell).

Douglas Stuart Katz, Psychology
Raleigh, North Carolina
Dissertation: The Post-High School Achievements of Inner-City Youth: A Follow-Up Study of Graduates of the Washington, D. C., Public Schools. (Under the direction of Donald W. Drewes).

Benjamin Upchurch Kittrell, Crop Science
Kittrell, North Carolina
Dissertation: Effects of Four Leaf Numbers Per Acre and Three Nitrogen Rates on the Agronomic, Economic and Chemical Characteristics of Bright Tobacco. (Under the direction of William K. Collins).

Daniel Lee Kline, Entomology
Douglasville, Pennsylvania
Dissertation: Coastal *Culicoides* of North Carolina: Species Composition, Seasonal Incidence, and Distribution within Salt Marsh Habitats. (Under the direction of Richard C. Axtell).

Frank Thomas Lloyd, Forestry
Roadstown, New Jersey
Dissertation: An Estimator of Variance for a Site Index Predictor Using a Family of Cumulative Total Height Growth Curves as the Model. (Under the direction of William L. Hafley).

Steven Roscoe Long, Marine Sciences
Winston-Salem, North Carolina
Dissertation: A Laboratory Study of the Influence of Currents on Wind Generated Waves. (Under the direction of Norden E. Huang).

Thomas Eugene Loynachan, Soil Science
Knoxville, Iowa
Dissertation: Nitrogen Removal from Swine Wastes. (Under the direction of Arthur G. Wollum).

Leon Franklin McGinnis, Jr., Industrial Engineering
Springville, Alabama
Dissertation: Approximate and Exact Solution Procedures for a Class of Facilities Location Problems. (Under the direction of David A. Link).

Edward Hunter Mallonee, Jr., Forestry
Linthicum Heights, Maryland
Dissertation: Effects of Thinning and Seasonal Time of Nitrogen Fertilization on the Growth of Pole-Sized Loblolly Pine (*Pinus taeda* L.). (Under the direction of Charles B. Davey).

Sudhir Kumar Mendiratta, Chemical Engineering
Nagaur, Rajasthan, India
Dissertation: Mixing Effects in the Photosensitized Polymerization of Vinyl Monomers. (Under the direction of Richard M. Felder).

John Arthur Menge, Plant Pathology
Minneapolis, Minnesota
Dissertation: The Effect of Forest Fertilization Upon Mycorrhizae of Loblolly Pine. (Under the direction of Larry F. Grand).

Real Michaud, Crop Science
Quebec, Quebec, Canada
Dissertation: The Effects of Selection for Self-fertility Among Non Inbred and Partly Inbred Progenies of Alfalfa (*Medicago sativa* L.) on Self- and Cross-Fertility of Synthetic and Hybrid Varieties. (Under the direction of Thad H. Busbice).

Forest Leonard Miller, Jr., Statistics
Harriman, Tennessee
Dissertation: Statistics for Testing Uniformity on the Unit Interval. (Under the direction of Charles P. Quesenberry).

James Martin Mullen, Psychology
Pittsburgh, Pennsylvania
Dissertation: Factors of Deviant Behavior in Mental Patients. (Under the direction of Bruce A. Norton and Margaret N. Wiebe).

Dennis V. O'Brien, Psychology
New York, New York
Dissertation: The Use of Stimulation as an Alternative Treatment of Self-Injurious Behavior in an Institution for the Retarded. (Under the direction of Howard G. Miller and Margaret N. Wiebe).

Sung Hyun Park, Statistics
Seoul, Korea
Dissertation: Experimental Designs for Estimating the Slope of Second Order Polynomial Response Surfaces. (Under the direction of Robert J. Hader).

Alice Cline Parker, Electrical Engineering
Birmingham, Alabama
Dissertation: A Generalized Approach to Digital Interfacing. (Under the direction of James W. Gault).

Wayne Charles Porter, Horticultural Science
Winona, Mississippe
Dissertation: Biochemical Studies of Varietal Response of Sweet Potato (*Ipomoea batatas* (L.) Lam.) Roots to Chilling Injury. (Under the direction of Daniel T. Pope and Leaton T. Kushman).

Alberto Ricardo Quisumbing, Horticultural Science
Cagayan de Oro City, Philippines
Dissertation: Host-Plant Resistance in Cucumbers: Influence of Plot Size and Seeding Rate in Screening for Field Resistance to Cucumber Beetles. (Under the direction of Richard L. Lower).

Hugh Livingston Roberts, Sociology
Asheboro, North Carolina
Dissertation: School Integration, Reference Groups and Premarital Permissiveness Standards: A Study of High School Students. (Under the direction of Charles V. Mercer and Glenn C. McCann).

George Cleveland Robertson, Genetics
Raleigh, North Carolina
Dissertation: Studies in the Population Biology of *Rumex hastatulus*, a Dioecious Colonizer. (Under the direction of Ben W. Smith).

Setyono Sastrosumarto, Forestry
Yogyakarta, Indonesia
Dissertation: A Model for Forest Stand Generation for Simulation Studies. (Under the direction of William L. Hafley).

William Edward Schlenger, Psychology
Rutherford, New Jersey
Dissertation: The Assessment of Health Service Scarcity: A Methodological Study. (Under the direction of Donald W. Drewes).

John William Sheffield, Engineering Science and Mechanics
Brownsville, Texas

Dissertation: Laminar Film Condensation of a Liquid Metal on a Vertical Channel in the Presence of an Electromagnetic Force. (Under the direction of John A. Edwards).

Joao Gilberto Correa da Silva, Statistics
Pelotas, Rio Grande do Sul, Brazil

Dissertation: The Analysis of Cross-Sectional Time Series Data. (Under the direction of Major M. Goodman and A. Ronald Gallant).

Robert Daniel Small, Biomathematics
Charleston, South Carolina

Dissertation: Some Difference and Differential Equations Used in Biology and Estimation of the Parameters of the Differential Equation. (Under the direction of H. Robert van der Vaart and M. B. Williams).

Neill Stephen Smith, Mechanical Engineering
Raleigh, North Carolina

Dissertation: Analytical Study of High Flow CO Electric Discharge Laser Systems. (Under the direction of Hassan A. Hassan).

Robert Lee Stallings, Chemical Engineering
Charleston Heights, South Carolina

Dissertation: Transport of Noble Gases in Blends of Polystyrene and Poly (2,6-Dimethyl 1,4 Phenylene Oxide). (Under the direction of Harold B. Hopfenberg).

Robert Richard Starbuck, Statistics
Hillsboro, Ohio

Dissertation: Optimal Tests for Separable Families of Hypotheses. (Under the direction of Charles P. Quesenberry).

Chao-Ching Tao, Mechanical Engineering
Fuchow, Fukien, Republic of China

Dissertation: Analysis of Turbulent Boundary Layers with Mass Addition and Combusion. (Under the direction of Hassan A. Hassan).

Richard Urbanik, Psychology
Southern Pines, North Carolina

Dissertation: Resistance of the Individual to Various Levels of Group Pressure: A Test of Cartwright's Power Formula. (Under the direction of James E. R. Luginbuhl).

Gert Van Wyk, Forestry
Pretoria, South Africa

Dissertation: Early Growth Results in a Diallel Progeny Test of *Eucalyptus grandis* W. Hill ex Maiden. (Under the direction of B. J. Zobel).

Johnson Chung Keng Wang, Mathematics
Raleigh, North Carolina
Dissertation: On Generalized Jacobson Rings. (Under the direction of Jiang Luh).

Larry G. Wells, Biological and Agricultural Engineering
Covington, Kentucky
Dissertation: An Analysis of Water Movement Theories Using Undisturbed Field Soil Cores. (Under the direction of Richard W. Skaggs and George J. Kriz).

William Paul Williams, Genetics
Aragon, Georgia
Dissertation: A Comparison of the Correlated Responses of Secondary Traits to Selection for Higher Yields Using Two Selection Procedures in Four Populations of Maize. (Under the direction of Charles W. Stuber and Robert H. Moll).

DEGREES CONFERRED

June 25, 1974

August 7, 1974

December 18, 1974

School of Agriculture and Life Sciences

BACHELOR OF SCIENCE IN CONSERVATION

Jointly Administered by the School of Agriculture and Life Sciences and the School of Forest Resources

Tommy Parks Greene (December, 1974) ..... Marshville
Larry Philips Hartis (June, 1974) ..... Indian Trail
Robert Warren Johnson (December, 1974) ..... Augusta, GA
Walter Andrew Spratt (December, 1974) ..... Hickory
Cauthorn Walker (June, 1974) ..... Raleigh
Roy Kirk Williams (June, 1974) ..... Raleigh

BACHELOR OF SCIENCE

Agricultural Economics

Walter McRrae Barefoot, Jr. (December, 1974) ..... Dunn
Bruce James Clifton, Jr. (December, 1974) ..... Lenoir
Michael Yarbrough Day (December, 1974) ..... Roxboro
*David Allen Driggs (June, 1974) ..... Chase City, VA
William Summerell Hall, Jr. (December, 1974) ..... Mt. Ulla
Stephen Lee Howard (December, 1974) ..... Rocky Mount
William Henry Jenkins, III (December, 1974) ..... Richmond, VA
Ayden Rose Lee, Jr. (December, 1974) ..... Clayton
Joseph Edward Stotesbury (June, 1974) ..... Plymouth

Agronomy

Steven Damsker (December, 1974) ..... New York, NY
Buck Holland Jones (June, 1974) ..... New Bern

* Honors

Animal Science

June Marie Brotherton (December, 1974) ..... Charlotte
Andrew Thomas Clayton (December, 1974) ..... Henderson
Ellen Marie Jenkins (December, 1974) ..... Stony Point
Dean Marshall Kight (December, 1974) ..... Barco
H*Gary Kim McCollum (December, 1974) ..... Greensboro
Samuel Lee McLamb, (June, 1974) ..... Four Oaks
*Randall Harrell Renegar (December, 1974) ..... Concord
*Scott Tindal Shelton (December, 1974) ..... Atlantic Beach
Donna Lou Shepherd (December, 1974) ..... Durham
Thomas Marshall Smith, Jr. (December, 1974) ..... Charlotte
Stephen Edward Suitt (August, 1974) ..... Mars Hill
*Charles Franklin Williams (August, 1974) ..... Mocksville
Robert Eugene Yarboro (December, 1974) ..... Shelby

Biological and Agricultural Engineering

Gary Stephen Brinkley (August, 1974) ..... Cary
Cam Buck Comer, Jr. (June, 1974) ..... Peachland
Glenn Douglas Morgan (August, 1974) ..... Spring Hope
Willis David Temple (December, 1974) ..... Bunnlevel

Biological Sciences

Roberta Jane Austin (December, 1974) ..... Southern Pines
Foston Curtis (June, 1974) ..... Auburn
Dorothy Ann Gamble (December, 1974) ..... Raleigh
*Charles Michael Gammon (June, 1974) ..... Raleigh
**John Oscar Hackman (December, 1974) ..... Newark, DE
Paul Thomas Hathcock (December, 1974) ..... Concord
Patrick Robert Houser (June, 1974) ..... Havelock
Gaylord Steven Jinno (December, 1974) ..... Durham
*Edward Claude Jones (August, 1974) ..... Dobson
Jann Blackley Sorrell (December, 1974) ..... Garner
Carol Majors Willard (December, 1974) ..... Atlanta, GA

Botany

George Christopher Fried (June, 1974) ..... Allentown, PA
*Harry Sidney LeBlanc (December, 1974) ..... Charlotte

Food Science

David Michael Finley (December, 1974) ..... Simpsonville, SC
Richard Story Gragg (December, 1974) ..... Mooresville
James Richard Griffin, Jr. (June, 1974) ..... Charlotte
H*Jane Russell Hay (December, 1974) ..... Raleigh
Ellen Marie Jenkins (December, 1974) ..... Stony Point
Tommy W. Moses (August, 1974) ..... Spring Hope
Edgar Linwood Parker (December, 1974) ..... Elizabeth City
Michael Dennis Taylor (December, 1974) ..... Morristown, NJ

Horticultural Science

Harold John Blackmore, III (June, 1974) ..... Springfield, MA
David Frank Coston (August, 1974) ..... Hendersonville

* Honors ** High Honors H Honors Program

Ervin Dave Evans (December, 1974) ..... Charlotte
Michael Edward Fultz (December, 1974) ..... York, PA
Patricia Ann Harrison (June, 1974) ..... Durham
**John Leroy Hipp (December, 1974) ..... Charlotte
Michael Josh Jordan (December, 1974) ..... Candor
*Joseph Lon Miller (December, 1974) ..... Raleigh
William David Perkins (June, 1974) ..... Livingston, NJ
Sara Elizabeth Spayd (December, 1974) ..... Currie
Raby Leigh Traylor, III (December, 1974) ..... Norlina

Individualized Study Program

Cheryl June Snyder (August, 1974) ..... Wilmington

Medical Technology

Charlene Anne Henshaw (June, 1974) ..... Crestview, FL
**Rena Marie Martin (June, 1974) ..... Wadesboro

Poultry Science

Phillip Grant Bare (December, 1974) ..... Jefferson
June Marie Brotherton (December, 1974) ..... Charlotte
Andrew Thomas Clayton (December, 1974) ..... Henderson
Michael Stephen Hoots (August, 1974) ..... Winston-Salem
H*Gary Kim McCollum (December, 1974) ..... Greensboro
Samuel Lee McLamb (June, 1974) ..... Four Oaks
Larry Kent Winslow (December, 1974) ..... High Point
Robert Eugene Yarboro (December, 1974) ..... Shelby

Rural Sociology

Robert Howard Thornton (August, 1974) ..... Durham

Wildlife Biology

Charles Frank Balducci (December, 1974) ..... Sunbury, PA
Mark Stevens Bercegeay (December, 1974) ..... Newport
Todd Alan Burkhardt (December, 1974) ..... Lancaster, PA
Mark Dwain Horne (December, 1974) ..... Richlands
H*Debra Marie Hunt (December, 1974) ..... Trenton, NJ
Bradley Ray Jenkins (June, 1974) ..... Raleigh
Martin Christopher Kaehny (December, 1974) ..... New City, NY
*William Richard Noyes (December, 1974) ..... Bethesda, MD
Carl Allen Propst, Jr. (August, 1974) ..... Concord
Isaac Rhodes Robinson, Jr. (June, 1974) ..... Asheboro
Glenn White Safrit, Jr. (December, 1974) ..... Concord
Ransom Newell Smith, Jr. (December, 1974) ..... Fayetteville
John Thomas Thomas, Jr. (December, 1974) ..... Franklin, VA

Zoology

*Tate Boys Allen (December, 1974) ..... Charlotte
*Martha Kathryn Booth (December, 1974) ..... Fayetteville
Gary Michael Breedlove (December, 1974) ..... Andrews
Dorothy Anne deBruyne (December, 1974) ..... Durham

* Honors ** High Honors H Honors Program

H**Jerry Michael Foster (December, 1974) ..... Newton
John Early Foster, III (December, 1974) ..... Garner
Bonnie Joyce Frazier (December, 1974) ..... Raleigh
**Teresa Gray Fulp (June, 1974) ..... Winston-Salem
Mary Llewellyn Godwin (December, 1974) ..... Wilmington
James Richard Griffin, Jr. (June, 1974) ..... Charlotte
Ida Delaney Holmes (August, 1974) ..... Shallotte
Charles Wayne Hoyle (June, 1974) ..... Charlotte
Kenneth David Jessup (June, 1974) ..... Greensboro
Frank Joseph Johnson, Jr. (June, 1974) ..... Atlanta, GA
Robert Scott Kelemen (June, 1974) ..... Charlotte
*Valerie Adams Lefler (August, 1974) ..... Olympia, WA
*Brian Lewis Matthews (December, 1974) ..... Fayetteville
*Robert Edmund McCollum, Jr. (December, 1974) ..... Raleigh
*Randall Harrell Renegar (December, 1974) ..... Concord
Glenn White Safrit, Jr. (December, 1974) ..... Concord
Roger Nicholas Shaver (August, 1974) ..... Charlotte
Earle Craig Smith (December, 1974) ..... Asheboro
Gary Houston St. Clair (December, 1974) ..... Covington, VA
Leslie Noel Sturmer (December, 1974) ..... Myrtle Beach, SC
**Hubert Hiram Thomason, Jr. (December, 1974) ..... Charlotte
Blake Lee Travitz (December, 1974) ..... Philadelphia, PA
Albert Jesse Vail, III (December, 1974) ..... Pikeville
*Somnuk Vixaysouk (December, 1974) ..... Austin, Texas
*George Lynn Whiteside (August, 1974) ..... Charlotte
Daniel Whitley, Jr. (August, 1974) ..... Stantonsburg
*Martha Davis Wilson (December, 1974) ..... Raleigh
*Keith Alan Yount (December, 1974) ..... Hickory
*Anton Zeman (December, 1974) ..... Raleigh

School of Design

BACHELOR OF ENVIRONMENTAL DESIGN IN ARCHITECTURE

John Dale Benson (December, 1974) ..... Concord
Donald Stephen Fitzpatrick (December, 1974) ..... Sanford
*Donald Craig Gobble (December, 1974) ..... Winston-Salem
Benjamin Willard Hatcher (June, 1974) ..... Smithfield
George Wesley Lasley (December, 1974) ..... Lake Junaluska
*William Dwight McNeill (August, 1974) ..... Sanford
**Harry Nicholas Mackie (December, 1974) ..... Raleigh
Thomas Kesler McLaughlin, Jr. (December, 1974) ..... Raleigh

* Honors ** High Honors H Honors Program

Charles Lee Schofield, II (December, 1974) ..... Smithfield
**James William McKittrick Smith (December, 1974) ..... Raleigh
*Craig Umanoff (December, 1974) ..... New York
Arthur Edward Wesche (December, 1974) ..... Raleigh

BACHELOR OF ENVIRONMENTAL DESIGN IN LANDSCAPE ARCHITECTURE

Dennis Kirkland Mercer (December, 1974) ..... Jacksonville

BACHELOR OF ENVIRONMENTAL DESIGN IN PRODUCT DESIGN

Grace Erh-Ping Li (December, 1974) ..... Greensboro
Kenneth McClellan Maness (December, 1974) ..... Raleigh
John Russell Powell, Jr. (June, 1974) ..... Raleigh

School of Education

BACHELOR OF ARTS IN PSYCHOLOGY

Christopher Karl Busch (December, 1974) ..... Raleigh
William Inslee Coddington, Jr. (August, 1974) ..... Charlotte
Luana Dinager Enders (December, 1974) ..... Raleigh
Douglas Burns Featherstone (June, 1974) ..... Ramsey, NJ
*Nancy Parnell Gibson (December, 1974) ..... Gibson
Marcia Elizabeth Johnston (August, 1974) ..... Charlotte
**Margareta Holmstrom Norris (December, 1974) ..... Oslo, Norway
*Sharon Lee Rumack (December, 1974) ..... Brooklyn, NY
Shin Emmitt Vandervort (August, 1974) ..... Fayetteville
Sarah Williams (December, 1974) ..... Southern Pines

BACHELOR OF SCIENCE IN EDUCATION

Agricultural Education

Donald Ray Abernathy (December, 1974) ..... Landis
Martin Lewis Chriscoe (December, 1974) ..... West End
William D. Gaddy (December, 1974) ..... Wadesboro
Eric Timothy Hufham (June, 1974) ..... Clarkton
Sophronia Sue Long (December, 1974) ..... Nakina
*Franklin Daniel Shaw (December, 1974) ..... Richlands
Charles Martin Smith (December, 1974) ..... Ayden
Jerry Ray Strickland (December, 1974) ..... Cerro Gordo

* Honors ** High Honors

Industrial Arts Education

Rhoda Darnell Glover (December, 1974) ..... Morehead City
Joseph Reed Jacaruso (December, 1974) ..... Vanceboro
**James Luther Jones, III (December, 1974) ..... New Bern
Gene Morris Sharpe (December, 1974) ..... Durham
Karen Jane Snipes (June, 1974) ..... Charlotte
James Carroll Taylor (June, 1974) ..... Newland

Mathematics Education

Patricia Leigh Blue (December, 1974) ..... Carthage
*Daniel Eugene Faucette (December, 1974) ..... Browns Summit
**Amanda Davis Gane (December, 1974) ..... Lumberton
*Sarah Hunt Gifford (December, 1974) ..... Lumberton
Martha Jansky Lowry (December, 1974) ..... Spring Hope
*Monica Cecilia Polowy (December, 1974) ..... Greensboro
**Mary Susan Southall (August, 1974) ..... Richmond, VA
*Sharon West Stack (June, 1974) ..... Greensboro
*Marilyn Gray Sugg (December, 1974) ..... Snow Hill
Susan Markham Thompson (December, 1974) ..... Elizabeth City
George Sidney Viverette (August, 1974) ..... Enfield
*Clara Ann Wallis (December, 1974) ..... Raleigh
**Ronald Harry Weiger (December, 1974) ..... Raleigh

Science Education

*William Ralph Cameron, Jr. (December, 1974) ..... Shelby
Rebecca Lynn Daughtery (December, 1974) ..... Smithfield
William David Duncan (December, 1974) ..... Burlington
George Brown Furman (December, 1974) ..... Raleigh
James Hasson Martin (December, 1974) ..... Raleigh
**Susan Peterlin Shimer (December, 1974) ..... Clifton, NJ
Helen Stephens Thomas (December, 1974) ..... Smithfield
*Tommy Michael Tillman (December, 1974) ..... Carthage
Robert Franklin Woody, Jr. (December, 1974) ..... Elon College

Technical Education

*Franklin T. Frazier (December, 1974) ..... Cary
*James LaNell Painter (August, 1974) ..... Elizabeth City
**Michael David Ratcliff (June, 1974) ..... Raleigh

Vocational Industrial Education

Jack Donald Ballard, Jr. (June, 1974) ..... Rocky Mount
Edward Russell Becken (December, 1974) ..... Raleigh
*Marvin Lewis Cassio (August, 1974) ..... Weldon
Jerry Spencer Delbridge (August, 1974) ..... Henderson
Bruce Nolton Shaw (December, 1974) ..... Richmond, VA

* Honors ** High Honors

School of Engineering

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING

Charles William Dinkel (August, 1974) .....Winston-Salem

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

Irel Wayne Ball (August, 1974) .....Mooresville
Ronald Brown (December, 1974) .....Rose Hill
Seaman Knapp Hudson, Jr. (December, 1974) .....Florence, SC
Bruce Alan Smith (August, 1974) .....Winston-Salem
**Jeffrey Alan Smith (December, 1974) .....Cary
Robert Hardy Wilson (December, 1974) .....Red Bank, NJ

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Louis Anderson Banks (June, 1974) .....Raleigh
Ernest Hilliard Barber (December, 1974) .....High Point
Chiles Kenneth Barnes (June, 1974) .....Raleigh
*Jesse Allen Barnhill, Jr. (December, 1974) .....Tarboro
Charles Daniel Blackwell (December, 1974) .....Raleigh
Donnie Wayne Brewer (December, 1974) .....Greenville
Lawrence Wayne Brogden (December, 1974) .....Durham
Jimmy Dean Clark (December, 1974) .....Stoneville
Wates Austin Cole (December, 1974) .....Weaverville
Anthony Ragland Combs (December, 1974) .....Eden
**James Allan Cramer (June, 1974) .....Pittsburgh, PA
John Cowan Darden, Jr. (December, 1974) .....Farmville
Carl Ray Dawson, Jr. (December, 1974) .....Jacksonville
Stephen Lane Hall (December, 1974) .....Greensboro
Robert Henke (December, 1974) .....Raleigh
Billy Wayne Hicks (December, 1974) .....Selma
John Raymond Hoffman, Jr. (December, 1974) .....Charlotte
David Lee Hosan (June, 1974) .....Wilmington, DE
Dana Dallas Jacobs (December, 1974) .....Maxton
Charles Augustus Joyner, Jr. (August, 1974) .....Farmville
Jack Gordon Layton, Jr. (December, 1974) .....Sanford
*Henry Van Liles, Jr. (December, 1974) .....Morganton
Michael Cameron Lockamy (December, 1974) .....Greensboro
Donald Keith Lowe (December, 1974) .....Gastonia
Randy Lee Milburn (December, 1974) .....Lincolnton
Arthur Edwin Parrish, Jr. (December, 1974) .....Cary
Samuel FitzSimons Ravenel (August, 1974) .....Martinsville, VA
Ruel Cecil Shaw (December, 1974) .....Bladenboro

* Honors ** High Honors

Jerry Neal Slayton (June, 1974) ..... Charlotte
Luie Jackson Starnes, Jr. (December, 1974) ..... Charlotte
Carlton Bruce Taylor (December, 1974) ..... Raleigh
William Richard Ward (December, 1974) ..... Raleigh

BACHELOR OF SCIENCE IN CIVIL ENGINEERING, CONSTRUCTION OPTION

*Richard Francis Boedicker, Jr. (June, 1974) ..... High Point
Roger Dale Chambers (December, 1974) ..... Canton
William Andrew Corbett, Jr. (December, 1974) ..... Mebane
Joseph Anthony DeStefano (December, 1974) ..... City Island, NY
Frederick Stephen Duke (December, 1974) ..... Wilmington
*James David Duncan, Jr. (December, 1974) ..... Hickory
*Carl Ronald Gilchrist (December, 1974) ..... Greenville
Daniel Andrew Hawkins (December, 1974) ..... Raleigh
Thomas Allen Humphries (December, 1974) ..... Weaverville
Ronald Erwin Jones (December, 1974) ..... Mebane
*Stephen Phillip Jones (December, 1974) ..... Clemmons
Rene Langford (December, 1974) ..... Raleigh
Larry Upshur Melson (August, 1974) ..... Asheville
Michael Kennedy Norton (August, 1974) ..... Hickory
*James Nelson Patton (December, 1974) ..... Rutherfordton
William Thomas Russell, Jr. (December, 1974) ..... Greensboro
James Reed Watson (June, 1974) ..... Greensboro

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Andrew Spiros Apostolopoulos (December, 1974) ..... Asheville
Gene Edward Beck (December, 1974) ..... Thomasville
Randolph Gene Brecheisen (December, 1974) ..... Raleigh
*Michael Eugene Bowman (December, 1974) ..... Hickory
*Elmer Harvey Braxton (August, 1974) ..... Graham
Juan Rico Caudill (December, 1974) ..... Havelock
James Keith Chipman (August, 1974) ..... Boone
H**Timothy Chen Kuang Chou (December, 1974) ..... Hickory
**David Franklin Craig (December, 1974) ..... Asheville
James Carroll Crook (December, 1974) ..... Greensboro
James Richter Davis (December, 1974) ..... Kinston
David August Desrosiers (December, 1974) ..... Butner
James Brent Ebert (December, 1974) ..... Kernersville
Robert Stenson Gemp (August, 1974) ..... Cincinnati, OH
*Robert Nathan Hall (December, 1974) ..... Gastonia
Richard Lang Hill (December, 1974) ..... Hendersonville
Daniel Patrick Hunter (December, 1974) ..... Charlotte
John David Johnson (August, 1974) ..... Rocky Mount
John Lee Kester (December, 1974) ..... Raleigh
Charles Stanley Lambeth (December, 1974) ..... Albemarle
Michael Owens Lindsay (December, 1974) ..... Morganton
Daniel Hatcher Lowe (December, 1974) ..... Garner
William Samuel May (December, 1974) ..... Winterville
Donald Melvin McDowell (December, 1974) ..... Apex
Robert John Meffert (December, 1974) ..... Durham
*John Thomas Orr (December, 1974) ..... Newton
Norman Lynn Pendleton, Jr. (December, 1974) ..... Elizabeth City

* Honors ** High Honors H Honors Program

Robert Scott Pollock, III (December, 1974) ..... Raleigh
James Minetree Pyne, Jr. (December, 1974) ..... Burlington
Nolan Price Saunders (December, 1974) ..... Biscoe
Dale George Skurla (December, 1974) ..... Parma, OH
Robert Eric Snow (December, 1974) ..... Oxford
John Spence Tannery, Jr. (August, 1974) ..... Raleigh
Ronald Dale Varner (December, 1974) ..... High Point

BACHELOR OF SCIENCE IN ENGINEERING OPERATIONS

Michael Boyd Allison (December, 1974) ..... Charlotte
Kenneth Wilson Atwood (December, 1974) ..... Thomasville
Robert Norman Binns (December, 1974) ..... Raleigh
Frederick Mitchell Birkmaier (August, 1974) ..... Marshville
Gordon Lee Brown (August, 1974) ..... Burlington
William Norris Bullock (June, 1974) ..... Greensboro
Junius Riley Bunn, Jr. (December, 1974) ..... Raleigh
*Max Sylvanus Clark, Jr. (December, 1974) ..... Cherryville
Victor Dillard Copelan (December, 1974) ..... Raleigh
Donald Earl Durnil (December, 1974) ..... Forest City
Randy Reid Hedrick (December, 1974) ..... High Point
Michael Reid Hudson (December, 1974) ..... Benson
William Howerton Kirkpatrick, Jr. (December, 1974) ..... Richmond, VA
Needham Walton Langston, Jr. (December, 1974) ..... Durham
Joseph William Mason (December, 1974) ..... Mocksville
Linny Glenn Nichols (December, 1974) ..... Thomasville
Sandy Douglass Ross (December, 1974) ..... Matthew
Jennings Brooks Teal, Jr. (December, 1974) ..... Tarboro
**Robert Gray Thomas (December, 1974) ..... Garner
Bradford Thomas Thompson (August, 1974) ..... Goldsboro
Jeffrey Marshall Truncer (December, 1974) ..... Asheville
Joseph Michael Vaughn (December, 1974) ..... Mooresville
Leon Covington Walsh, III (December, 1974) ..... Fayetteville
Benjamin Earl Winstead, III (August, 1974) ..... Rocky Mount
Ronald Eugene Wise (June, 1974) ..... Salisbury

BACHELOR OF SCIENCE IN ENGINEERING SCIENCE AND MECHANICS

Grady Hoyle Davenport, Jr. (August, 1974) ..... Raleigh
H**Guey Chia Lu (December, 1974) ..... Hong Kong
Bryon Dale Luna (December, 1974) ..... Charlotte
Richard Adrian Phillips (December, 1974) ..... Hudson
David Earl Ramsey, Jr. (December, 1974) ..... Lincolnton
John Robert Straughn (December, 1974) ..... Greensboro
David Glenn Walthall (December, 1974) ..... Fayetteville

BACHELOR OF SCIENCE IN FURNITURE MANUFACTURING AND MANAGEMENT

Roy Lee Allen, Jr. (June, 1974) ..... Farmville
**Edward James Gerken, Jr. (December, 1974) ..... Norwalk, OH
Larry Lynn Hoover (December, 1974) ..... High Point
Christopher Ray Sigmon (August, 1974) ..... Charlotte
Philip Emerson Smith (December, 1974) ..... Grantsboro

* Honors ** High Honors H Honors Program

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

Jahanmir Azali (June, 1974) ..... Shiraz, Iran
Richard Leonard Brandon (August, 1974) ..... Lexington
Merle Wayne Burton (December, 1974) ..... Durham
Thomas Tammel Dornbush (December, 1974) ..... Asheboro
*James Craig Edsall (December, 1974) ..... Concord
Avishai Slochowski Golergante (June, 1974) ..... Lima, Peru
James Leonard Gould (December, 1974) ..... Winston-Salem
Joseph Howard Inabinet (June, 1974) ..... Winston-Salem
H**Thomas Kregg Laundon (December, 1974) ..... Norfolk, VA
John Dallas Mackie, Jr. (December, 1974) ..... Oxford
*Randy Edward Marshall (December, 1974) ..... Taylorsville
Aphiram Poshakrishna (August, 1974) ..... Bangkok, Thailand
*Francisco Alberto Salvador Salazar (August, 1974) ..... Quito, Ecuador
H**Randy Arnold Walker (December, 1974) ..... Lenoir
Robert Earl Young (December, 1974) ..... Swansboro

BACHELOR OF SCIENCE IN MATERIALS ENGINEERING

Hassan Ehteshami (December, 1974) ..... Raleigh

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Julian Edward Arrington, II (December, 1974) ..... Beaufort
*Dale Arthur Babcock (June, 1974) ..... Charlotte
*Michael Coleman Black (June, 1974) ..... Mt. Holly
*William Charles Bryan (December, 1974) ..... Tar Heel
Mark Andrew Cigal (June, 1974) ..... West Suffield, CT
Dennis Dean Chinn (December, 1974) ..... Greensboro
James Ronald Gilmore (December, 1974) ..... Charleston, SC
Ricky Harris Laurence (December, 1974) ..... West Jefferson
Nhi Dong Le (December, 1974) ..... Fayetteville
Fereidoon Mahjoobi (December, 1974) ..... Tehran, Iran
Eduardo Martinez (December, 1974) ..... Fayetteville
Charles Reid Morgan, Jr. (December, 1974) ..... Fayetteville
Masoud Motahari (December, 1974) ..... Tehran, Iran
Gerald Lewis Osborn (December, 1974) ..... Sanford
David Keith Osborne (August, 1974) ..... West Jefferson
*George Thomas Rogers (December, 1974) ..... Hartsville, SC
Abdul Basir Sadat (December, 1974) ..... Kabul, Afghanistan
*James Thomas Spencer, III (December, 1974) ..... Greensboro

BACHELOR OF SCIENCE IN NUCLEAR ENGINEERING

Gregory Louis Bender (December, 1974) ..... Menlo Park, CA
Larrie Gene Cable (December, 1974) ..... Tucson, AZ
Curtis Lee Coggin, Jr. (December, 1974) ..... Durham
Paul Jay Seymour (August, 1974) ..... Deposit, NY
*Oswald Joseph Zeringue, Jr. (December, 1974) ..... Raleigh

* Honors ** High Honors H Honors Program

School of Forest Resources

BACHELOR OF SCIENCE IN CONSERVATION

Jointly administered by the School of Forest Resources and the School of Agriculture and Life Sciences

Adlai Michael Arthur (December, 1974) ..... Princeton
Frank Scott Chappell (December, 1974) ..... Raleigh
Dorothy Anne deBruyne (December, 1974) ..... Durham
William Kimberly Hensley (December, 1974) ..... Sanford
Phillip Russell Hunnicutt (December, 1974) ..... Eden
H*Debra Marie Hunt (December, 1974) ..... Trenton, NJ
Philip Luther Knauff (June, 1974) ..... Newton
Franklin Taylor Liles, Jr. (December, 1974) ..... Raleigh
**Tony Ray Short (June, 1974) ..... Norlina
Leslie Arden Thornbury (June, 1974) ..... Raleigh
Robert Davis Warren, Jr. (December, 1974) ..... Benson
*Buren Lamar Wortman (December, 1974) ..... Shelby

BACHELOR OF SCIENCE IN FORESTRY

Joseph Oren Ashley (December, 1974) ..... Warrensville
John Britt Bunn (August, 1974) ..... Raleigh
Allen Lloyd Childers (June, 1974) ..... Valdese
William David Conard (August, 1974) ..... Clyde
*James Floyd Hodges (August, 1974) ..... Boone
Mark Dwain Horne (December, 1974) ..... Richlands
Russell Franklin Huffman (August, 1974) ..... Thomasville
Phillip Russell Hunnicutt (December, 1974) ..... Eden
Donald James Lambeth (August, 1974) ..... Jackson Springs
Ronald Everett Miller (August, 1974) ..... Colerain
John Thomas Peeler (December, 1974) ..... Salisbury
Elbert Bynum Riggsbee (August, 1974) ..... Carrboro
*Peter Garwood Roeck (December, 1974) ..... Williamsville, NY
*Robert Carroll Seli, Jr. (December, 1974) ..... Pittsburgh, PA
William Howard Swint (December, 1974) ..... Bethesda, MD
Randall Myers Thompson (December, 1974) ..... Roxboro
Robert Henry Wilds (August, 1974) ..... Florence
Michael Ray Williams (June, 1974) ..... East Bend

BACHELOR OF SCIENCE IN NATURAL RESOURCE RECREATION MANAGEMENT

William David Conard (August, 1974) ..... Clyde
*Robert Shields Hicks, Jr. (December, 1974) ..... Durham

* Honors ** High Honors H Honors Program

Philip Luther Knauff (June, 1974) ..... Newton
*Stephen Russell Mathey (August, 1974) ..... Mineral City, OH
Reed Folsom Morgan (December, 1974) ..... Weaverville
Elbert Bynum Riggsbee (August, 1974) ..... Carrboro
Robert Davis Warren, Jr. (December, 1974) ..... Benson
*Dwight Foster Williams (December, 1974) ..... Elizabeth City

BACHELOR OF SCIENCE IN PULP AND PAPER SCIENCE AND TECHNOLOGY

Gary Goodwin Trexler (December, 1974) ..... Rockingham

BACHELOR OF SCIENCE IN RECREATION AND PARK ADMINISTRATION

Howard Frank Abbey (August, 1974) ..... New Bern
Pamela Sloan Anderson (December, 1974) ..... Chesapeake, VA
John Richard Crompton, Jr. (December, 1974) ..... Asheville
Robert Michael Dornbush (December, 1974) ..... Ashboro
Stephen Wright Dunn (December, 1974) ..... Raleigh
William Rex Eatmon (August, 1974) ..... Raleigh
John Burton Gillette, Jr. (December, 1974) ..... Wilson
Johnnie G. Hardee (August, 1974) ..... Holly Springs
William Kimberly Hensley (December, 1974) ..... Sanford
Henry Willard Howerton, Jr. (December, 1974) ..... Raleigh
Barry Lorayne Judge (December, 1974) ..... Scotland Neck
Marshall David Kestler (August, 1974) ..... Charlotte
Herbert Edwin Littrell (August, 1974) ..... Rocky Mount
Philip Warren Mobley (December, 1974) ..... Robersonville
Kathy Kellogg Moss (August, 1974) ..... Lexington
Samuel Thomas Moss (August, 1974) ..... Cherryville
Glyn Young Nesbitt (August, 1974) ..... Charlotte
Sharon Smith Pocock (December, 1974) ..... Raleigh
William Howard Rich (August, 1974) ..... Woolrich, PA
Nathan Michael Royal (December, 1974) ..... Fayetteville
James Richard Semple, Jr. (August, 1974) ..... Fayetteville
Kirby Tallman Shimp (December, 1974) ..... Montoursville, PA
Danny Marcus Smith (December, 1974) ..... Louisburg
Thomas James Tilley (December, 1974) ..... Coopersburg, PA
Eugene Raymond Tomlinson (August, 1974) ..... Raleigh
Keith Austin Vaughan (August, 1974) ..... Scotland Neck
*Mark Thomas Voelker (December, 1974) ..... High Point
*Grady Morgan Wesson (December, 1974) ..... Newport News, VA

BACHELOR OF SCIENCE IN WOOD SCIENCE AND TECHNOLOGY

Martin Reb Lucas (December, 1974) ..... Wilson
*John Milton McCrary (December, 1974) ..... Lexington

DAVID DAVENPORT HUCKABEE (DEC. 1974)

* Honors

School of Liberal Arts

BACHELOR OF ARTS

Marcus Henderson Allen, Jr. (June, 1974) ..... Maxton
Donna Tishy Armstrong (August, 1974) ..... Rocky Mount
*Terry Lee Bailey (August, 1974) ..... Newport
David Robert Baumgardner (August, 1974) ..... Raleigh
*Marian Simons Beightol (June, 1974) ..... Cary
Henry Murray Bousman, Jr. (June, 1974) ..... Eden
Ward Ross Burtnette (August, 1974) ..... Raleigh
Donald Kenneth Byrnes (June, 1974) ..... Charlotte
*Wayne Bernard Case (August, 1974) ..... E. Flat Rock
Robert Bryan Chadwick (August, 1974) ..... Raleigh
Deborah Jean Church (June, 1974) ..... Raleigh
Karen Entsminger Cooper (August, 1974) ..... Covington, VA
Elizabeth Shannon Davenport (June, 1974) ..... Raleigh
William Nelson Davis, II (August, 1975) ..... Seaboard
Susan Connor Elliott (August, 1974) ..... Durham
Deborah Olivia Evans (June, 1974) ..... Princeton
Earl Allen Fair, Jr. (June, 1974) ..... Greenville, SC
Charles Eugene Felts (June, 1974) ..... Wilson
Joan M. Finkel (August, 1974) ..... Raleigh
Carl Douglas Fisher (August, 1974) ..... Cary
*Laura Perry Hale (August, 1974) ..... Raleigh
Rachel Ann Harrelson (August, 1974) ..... Southport
Johnnie Warren Harris (June, 1974) ..... Asheville
**Willette Christine Harrison (June, 1974) ..... Rocky Mount
Jennifer Denise Holmes (August, 1974) ..... Raleigh
Patricia Smith Hoover (August, 1974) ..... Raleigh
George Dewey Hudson, Jr. (August, 1974) ..... Turkey
Patrick Lee Ivey (August, 1974) ..... Raleigh
Richard Brown Kanoy, Jr. (June, 1974) ..... Thomasville
Reinhard Ernst Koch (August, 1974) ..... Raleigh
Rodney Stephen Maddox (August, 1974) ..... Bryson City
Mereibah Joy Mangrum (June, 1974) ..... Raleigh
*Charles Clifton Martin (August, 1974) ..... Raleigh
*Deryl Winston Martin (August, 1974) ..... Apex
Jerry Hughes Martin (August, 1974) ..... Shallotte
Patrick Dickson Merritt (August, 1974) ..... Roanoke, VA
Peggy James Miller (August, 1974) ..... Beulaville
Lou Gardner Miller (June, 1974) ..... Charlotte
*Virginia Antczak Motz (August, 1974) ..... Raleigh
Claude Galen Pardue (August, 1974) ..... Burlington
James Lee Piland (August, 1974) ..... Raleigh

* Honors ** High Honors

Harold Bates Plummer, Jr. (June, 1974) ..... Raleigh
Douglas Patrick Puryear (June, 1974) ..... Raleigh
*Elizabeth Adelaida Reeves (August, 1974) ..... Raleigh
Alan Douglas Roebuck (June, 1974) ..... Shelby
*Shirley Hager Rudolph (June, 1974) ..... Kinston
Kenneth Davis Sheesley (June, 1974) ..... Atlanta, GA
*Karen Denise Slack (August, 1974) ..... Greensboro
Stephen Patrick Smoral (August, 1974) ..... Danville, VA
Roger Lee Spruill (June, 1974) ..... Henderson
David Browning Stansel, Jr. (August, 1974) ..... Raleigh
Erick Irvin Steinberg (August, 1974) ..... Raleigh
Allen Herman Stephens (August, 1974) ..... Raleigh
*Holly Ann Thompson (August, 1974) ..... Raleigh
Julia Ann Tillery (August, 1974) ..... Halifax
Thomas Jarvis Tripp, III (August, 1974) ..... Raleigh
**Anne Costantini Wells (June, 1974) ..... Asheville
David Blount Whitley, Jr. (June, 1974) ..... Rocky Mount
John William Young, Jr. (August, 1974) ..... Greensboro
Richard Robert Zelno, II (June, 1974) ..... Raleigh

BACHELOR OF SCIENCE

Robert Franklin Ward (June, 1974) ..... New Bern

BACHELOR OF ARTS IN ACCOUNTING

Gary Francis Ridley (December, 1974) ..... Eden

BACHELOR OF ARTS IN BUSINESS MANAGEMENT

Sue Ellen Avery (December, 1974) ..... Morganton
Randall Harold Castleberry (December, 1974) ..... Smithfield
David Lewis Connor (December, 1974) ..... High Point
Thomas Elmer Deans, Jr. (December, 1974) ..... Bailey
Thomas Moore Fields (December, 1974) ..... Albemarle
Romeo Fontaine (December, 1974) ..... Cary
William Robert Fuller, Jr. (December, 1974) ..... Durham
Robert Charles Greene, Jr. (December, 1974) ..... Raleigh
Clifford Holt Jennings (December, 1974) ..... Raleigh
Thomas Wilson Land (December, 1974) ..... Charlotte
Stanley Bliss McClelland (December, 1974) ..... Raleigh
Philip Louis Oester (December, 1974) ..... Corvallis, OR
Joseph Wilbur Peacock (December, 1974) ..... Raleigh
Elizabeth Lane Pierce (December, 1974) ..... Raleigh
Charles Chandler Prince, Jr. (December, 1974) ..... Raleigh
James Clinton Richardson, Jr. (December, 1974) ..... Portsmouth, VA
Bruce Randall Walker (December, 1974) ..... Jackson, TN
Carl Elbert Wicker, Jr. (December, 1974) ..... Raleigh

BACHELOR OF ARTS IN ECONOMICS

Marshall Wayne Andrews (December, 1974) ..... Eden
Walter McRae Barefoot, Jr. (December, 1974) ..... Dunn
Lee Fitzgerald Cowper (December, 1974) ..... Kinston
**David Laurence Kendall (December, 1974) ..... Dodge City, KS

* Honors ** High Honors

*Joseph Hal Kinlaw, Jr. (December, 1974) ..... St. Pauls
Barbara Wallace LeCount (December, 1974) ..... Atlanta, GA
Michael James Lord (December, 1974) ..... Hendersonville
Joseph Ellett Maxey, Jr. (December, 1974) ..... Hendersonville
William Stewart Milliken, Jr. (December, 1974) ..... White Marsh, VA
Robert Mitchell Newton (December, 1974) ..... Raleigh

BACHELOR OF ARTS IN ENGLISH

Richard Arthur Ballou (December, 1974) ..... Greensboro
*Arnold Robye Butler (December, 1974) ..... Raleigh
*William Campbell Cowan (December, 1974) ..... Pinebluff
Rebecca Ann Della (December, 1974) ..... Raleigh
*Sandra Richards Edwards (December, 1974) ..... Tucker, GA
Luana Dinager Enders (December, 1974) ..... Raleigh
Ramona Diane Fann (December, 1974) ..... High Point
**Cordelia Evelyn Haines (December, 1974) ..... Arlington, VA
Gilbert Hay, III (December, 1974) ..... Raleigh
Michael James Lord (December, 1974) ..... Hendersonville
Rita Elizabeth Nelson (December, 1974) ..... Eden
**Yvonne Stafford Pike (December, 1974) ..... Charleston, SC
Barbara Jones Rork (December, 1974) ..... Burlington
Glenn Wiley Sledge (December, 1974) ..... Whiteville
Harriett McAllister Southerland (December, 1974) ..... Jacksonville
Denise Roberta Tidball (December, 1974) ..... Raleigh

BACHELOR OF ARTS IN HISTORY

Michael Keith Ballard (December, 1974) ..... Charlotte
Allen Edson Bates (December, 1974) ..... Cary
Larry Wayne Cagle (December, 1974) ..... Raleigh
Michael Devine (December, 1974) ..... Monroeville, PA
*Betty Disomma Dixon (December, 1974) ..... Raleigh
James Stephen Hamilton (December, 1974) ..... Raleigh
Wesley Graham Hilliard (December, 1974) ..... Durham
Ralph Albert Keith, Jr. (December, 1974) ..... Raleigh
James Edward Kingsberry (December, 1974) ..... Franklinton
Douglas Duncan Little (December, 1974) ..... Fayetteville
Virgil Lee Mallard (December, 1974) ..... Wendell
William Steven Pressley (December, 1974) ..... Monroe
Lowell Michael Rawls (December, 1974) ..... Cary
**William Milford Reeves (December, 1974) ..... Fayetteville
Richard Wayne Robeson (December, 1974) ..... Kannapolis
*Deborah Stallings Wunsch (December, 1974) ..... Raleigh

BACHELOR OF ARTS IN PHILOSOPHY

George Rudolph McDaniel (December, 1974) ..... Dublin
*Michael Geary White (December, 1974) ..... Hendersonville

BACHELOR OF ARTS IN POLITICS

Linda Lou Cooke (December, 1974) ..... Durham
Cynthia Dale Fulford (December, 1974) ..... Farmville
Raymond Charles Glennon (December, 1974) ..... Raleigh
Bruff Hickman Gwinn (December, 1974) ..... Dunn
Beverly Wynn Hodges (December, 1974) ..... Eden

* Honors ** High Honors

Eubert Wesley McLeod, Jr. (December, 1974) .....Raleigh
Judson Bost McManus, Jr. (December, 1974) .....Kannapolis
Ronald Allen Parrish, Sr. (December, 1974) .....Raleigh
Harold Winterson Smith, Jr. (December, 1974) .....Piscataway, NJ

BACHELOR OF ARTS IN SOCIOLOGY

Joseph Francis Ambrosia (December, 1974) .....Raleigh
*Judy Hardison Barnett (December, 1974) .....Kinston
Brenda Joyce Burchfield (December, 1974) .....High Point
Donna Leigh Byrd (December, 1974) .....Winston-Salem
Eleanor Susan Cashwell (December, 1974) .....Raleigh
Jerome Bayard Clark, III (December, 1974) .....Fayetteville
James Albert Collins, Jr. (December, 1974) .....Mayodan
Mark Stephen Dixon (December, 1974) .....Greensboro
Lewis Franklin Edwards (December, 1974) .....Franklinton
Cleveland Dixie Gilbert, Jr. (December, 1974) .....Cary
Leslie Pittman Hamilton (December, 1974) .....Raleigh
Nancy Iler Heffernan (December, 1974) .....Raleigh
James Henry Horth, III (December, 1974) .....Dalton, MA
Macon Marshall Jefferys (December, 1974) .....Raleigh
Monte Carol Maney (December, 1974) .....Asheville
Sally Sawyer McLaurin (December, 1974) .....Cary
Dennis Fredrick Michael (December, 1974) .....Raleigh
Susan Rebecca Moss (December, 1974) .....Fayetteville
*Mary Louise O'Connell (December, 1974) .....Raleigh
Edwin John Plato, Jr. (December, 1974) .....Raleigh
Joseph Harold Ross (December, 1974) .....Henderson
Roy Wayne Saunders (December, 1974) .....Fayetteville
*Alicia Karen Small (December, 1974) .....Burlington

BACHELOR OF ARTS IN SPEECH COMMUNICATION

Jonathan Stewart Shouse (December, 1974) .....Winston-Salem

BACHELOR OF SCIENCE IN ECONOMICS

Lee Craig Harris (December, 1974) .....Mobile, AL
Thomas Rollin Johnson (December, 1974) .....Statesville

School of Physical and Mathematical Sciences

BACHELOR OF SCIENCE IN CHEMISTRY

Donald Edgar Harris (December, 1974) .....Charlotte
*Harry Sidney LeBlanc (December, 1974) .....Charlotte
*Ernest Roscoe Lippard, III (August, 1974) .....Hickory
**George Henry Whitesides, Jr. (June, 1974) .....High Point

* Honors ** High Honors

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Virgil Hays Allen, Jr. (December, 1974) ..... Raleigh
Jerry Wayne Beersdorf (December, 1974) ..... Sumiton, AL
Keith Adrian Bowers (December, 1974) ..... Thomasville
Joseph John Boyle, Jr. (June, 1974) ..... Tamaqua, PA
Charles Barry Bradner (December, 1974) ..... Greensboro
Clinton Ray Collins (June, 1975) ..... Asheboro
William Floyd Cowan (August, 1974) ..... Raleigh
Susan Virginia Davis (December, 1974) ..... Elkin
Gilbert Allen DuPaul (December, 1974) ..... Stoughton, WI
Larry Wayne Fox (August, 1974) ..... Pleasant Garden
Carl B. Friedlander (December, 1974) ..... Raleigh
Michael Edward Gizinski (December, 1974) ..... Winston-Salem
Gary Stephens Hutchins (December, 1974) ..... Asheville
Kevin David Jones (June, 1974) ..... Wilmington
Sally Dell Marr (June, 1974) ..... Winston-Salem
Robert Frederick Patterson, Jr. (December, 1974) ..... Benton, AR
Ronnie Dale Pennell (December, 1974) ..... Lenoir
*James Brian Potter (December, 1974) ..... Zebulon
Walter Wood Pritchard (August, 1974) ..... Greensboro
*Clarence Rudolph Puryear, Jr. (June, 1974) ..... Raleigh
*Emil Daniel Revala (December, 1974) ..... Belle Vernon, PA
Thomas James Richburg (December, 1974) ..... Buffalo, NY
Lawrence Gilbert Robinson (December, 1974) ..... Greensboro
*Richard Mark Smith (June, 1974) ..... Cary
Robert Alan Spillman (December, 1974) ..... Fayetteville
Suzanne Marie Tilley (August, 1974) ..... Pinnacle
Steven Donald Wedoff (December, 1974) ..... Woodstock, IL
Becky Yuk Ping Yeung (December, 1974) ..... Vancouver, Canada

BACHELOR OF ARTS IN GEOLOGY

Daniel Moore Groome (December, 1974) ..... Greensboro
John Roy Holliday (December, 1974) ..... Brevard
Allan Randolph Newcomb (August, 1794) ..... Spring Hope
Rebecca Graves Walker (December, 1974) ..... Raleigh
William Aiken Wolfe, Jr. (December, 1974) ..... Monroe

BACHELOR OF SCIENCE IN GEOLOGY

Jesse Warren Faircloth, Jr. (December, 1974) ..... Siler City
*David Graves Gardner (August, 1974) ..... Charlotte
Jack Wayne Kearns, Jr. (December, 1974) ..... Badin
*Larry Eldred Kirkpatrick (December, 1974) ..... Woodland
Benjamin Joe McKenzie (August, 1974) ..... Clemmons
Robert Josephus Moye, Jr. (December, 1974) ..... Rocky Mount

BACHELOR OF SCIENCE IN MATHEMATICS

Jerry Sherier Blinten (December, 1974) ..... Fayetteville
*Leslie DeLaine Dyer (December, 1974) ..... Kinston
*Daniel Eugene Faucette (December, 1974) ..... Browns Summit
**Christine Elaine Flynt (December, 1974) ..... Clemmons
**James Allen Harrington (December, 1974) ..... Broadway

* Honors ** High Honors

*Charles LeRoy Heimbach (August, 1974) ..... Raleigh
Bonnie Kay Johnson (December, 1974) ..... Durham
La Monte MarVae Lee (June, 1974) ..... Roxboro
Donald Reid McQueen (December, 1974) ..... Raleigh
*Monica Cecilia Polowy (December, 1974) ..... Greensboro
Charles Michael Pratt (August, 1974) ..... Raleigh
Lawrence David Pupkiewicz (December, 1974) ..... Trevose, PA
Larry Russell Settlemyre (December, 1974) ..... Hickory
James Richard Stone (December, 1974) ..... Raleigh
**Robert Earl Thompson (August, 1974) ..... Raleigh

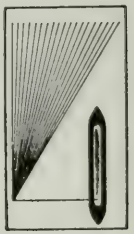
BACHELOR OF SCIENCE IN METEOROLOGY

Gerald Lee Freeman (December, 1974) ..... Raleigh

BACHELOR OF SCIENCE IN PHYSICS

Jerry Sheriar Blinten (June, 1974) ..... Fayetteville
*Ben Wesley Christenbury (December, 1974) ..... Charlotte
*William Alexander Gabbard (December, 1974) ..... Elkin
*Tommy Michael Tillman (December, 1974) ..... Carthage

School of Textiles



BACHELOR OF SCIENCE IN TEXTILE CHEMISTRY

Edward Jones Lancaster, III (August, 1974) ..... Charlotte
**Ashok Chimanlal Makati (December, 1974) ..... Raleigh
James Wilson Mercer, Jr. (December, 1974) ..... Vanceboro
William Ambrose Mills, III (December, 1974) ..... Charlotte
William Bradford Patten, Jr. (December, 1974) ..... Concord

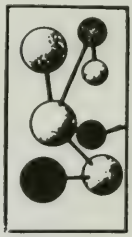
BACHELOR OF SCIENCE IN TEXTILE TECHNOLOGY

Geoffrey R. Angst (June, 1974) ..... Briarcliff, NY
Kenneth Ray Carter (December, 1974) ..... Goldsboro
**Randy Vance Crayton (December, 1974) ..... Stanfield
John Quincy Davis (June, 1974) ..... Needham, MA
Robert David Deal (June, 1974) ..... Greensboro
Ernest Iredell Fleming, III (June, 1974) ..... Rocky Mount
*Evelyn Diane Gardner (December, 1974) ..... High Point
Gerald Thomas Goodgame (June, 1974) ..... Charlotte
Jeffrey Lynn Heavner (December, 1974) ..... Rockingham
John Kidd Houston, Jr. (December, 1974) ..... Franklinton

* Honors ** High Honors

Dennis Keith Jordan (December, 1974) ..... Clemmons
Marsha Fennell Jordan (August, 1974) ..... Bowdens
**Charles Allen Keith, Sr. (August, 1974) ..... Kingsport, TN
Edward Jones Lancaster, III (August, 1974) ..... Charlotte
Laura Ann Laton (December, 1974) ..... Norwood
Frank Loon Lem, Jr. (August, 1974) ..... Wilmington
James Herbert Lytle, Jr. (August, 1974) ..... Clemmons
Wayne Arthur Manz, Jr. (June, 1974) ..... Tarboro
John Terence McDaniel (December, 1974) ..... Raleigh
Edward Burt McKenzie, Jr. (June, 1974) ..... Salisbury
Robert Michael Merritt (December, 1974) ..... Marietta, GA
Marcus Levine Monroe (August, 1974) ..... Rockingham
James Frank Moore, Jr. (August, 1974) ..... Greensboro
Melton Wayne Nixon, Jr. (August, 1974) ..... Concord
Stephen Lewis Owen (August, 1974) ..... Pisgah Forest
Mary Spring Page (December, 1974) ..... Aberdeen
Jonathan William Painter (December, 1974) ..... Old Fort
James Ronald Parson (December, 1974) ..... Willard
Irving Ray Peeler (December, 1974) ..... Salisbury
Malcolm Carter Roberts (June, 1974) ..... Etowah
Sophocles Sandukas (August, 1974) ..... Istanbul, Turkey
William Jake Taylor (December, 1974) ..... Nashville
Harrison James Williams, Jr. (December, 1974) ..... Hickory
Richard Stewart Winslow (December, 1974) ..... Greensboro
Charles James Woodward (December, 1974) ..... Aurora, NE
Jeter Conley Young, Jr. (August, 1974) ..... Asheville

Professional Degrees



CIVIL ENGINEER

William Howard Autry, Jr. (June, 1974) ..... Fayetteville
James Wray Hipps (December, 1974) ..... Canton
Jimmy Neil Smith (June, 1974) ..... Raeford
Robert Junius Snipes, Jr. (June, 1974) ..... Carthage

ELECTRICAL ENGINEER

Philip Arthur Frankenstein (December, 1974) ..... Durham
Jesse David Mauck (December, 1974) ..... Asheville

MECHANICAL ENGINEER

Tony Lee Matlock (June, 1974) ..... Salisbury

NUCLEAR ENGINEER

James William Leggette (December, 1974) ..... Tabor City
Nai-Chueh Wang (August, 1974) ..... Taiwan

** High Honors

Master's Degrees

MASTER OF AGRICULTURE

Abdurahman Ahmed Abdi (December, 1974) .....Mogadishu, Somalia
Raymond Durwood Coltrain (June, 1974) .....Oak City
Daniel G. Goff (August, 1974) .....Dearborn Heights, MI
James Digby Olson (August, 1974) .....Haxtun, CO
Vilaivun Sasibutra (December, 1974) .....Bangkok, Thailand

MASTER OF ARCHITECTURE

Porntip Boonsong (June, 1974) .....Bangkok, Thailand
Lyman Cornell Bryant (June, 1974) .....Franklin
Susan Monserud Christie (December, 1974) .....Raleigh
Luc Diep Hong (December, 1974) .....Saigon, Vietnam

MASTER OF BIOMATHEMATICS

Francine Johnson Ewing (December, 1974) .....Raleigh

MASTER OF CHEMICAL ENGINEERING

Paul Alan Boys (June, 1974) .....Wenatchee, WA

MASTER OF CIVIL ENGINEERING

Barton Joe Barham (August, 1974) .....Raleigh
Ramesh Gulabchand Fofaria (June, 1974) .....Raleigh
Philip Gamble Fisher (December, 1974) .....Kings Mountain
Ramey Floyd Kemp, Jr. (December, 1974) .....Raleigh
David Scot Leftwich (December, 1974) .....Raleigh
Larry William McPherson (December, 1974) .....Raleigh
Rugcharti Owasitthi (December, 1974) .....Uttaradit, Thailand
Mohammed Ezz-El-Din Tawfik (December, 1974) .....Cairo, Egypt

MASTER OF ECONOMICS

Edwin Warren Causey (June, 1974) .....Greenville
Surattana Chaiyanun (December, 1974) .....Bangkok, Thailand
Don Ennis Freeman (August, 1974) .....Hendersonville
Hugh Leslie Gerringer, Jr. (August, 1974) .....Raleigh
Michael Andrew Hilka (December, 1974) .....Raleigh
Kandice Helenne Kahl (December, 1974) .....Petersburg, VA
Carroll Roy Melton, Jr. (June, 1974) .....Raleigh
Jaya Sreekantan Nair (December, 1974) .....Raleigh
Enrique Ospina (December, 1974) .....Bogota, Colombia
Shri Krishna Upadhyay (June, 1974) .....Kathmandu, Nepal
Gary James Wells (December, 1974) .....Asheville

MASTER OF EDUCATION

Adult and Community College Education

Ruth Ann Andrews (December, 1974) ..... Spring Lake
William Terrence Anton (December, 1974) ..... Fayetteville
Cynthia Ann Berban (December, 1974) ..... Orlando, FL
David Michael Bevacqua (August, 1974) ..... Raleigh
Dorothy Perline Boone (December, 1974) ..... Garland
George Peter Chagalis (August, 1974) ..... Maysville, KY
Charles Paul Christy (December, 1974) ..... Massena, NY
Aretta Yarbrough Downing (December, 1974) ..... Fayetteville
Laurel Jones Goulding (December, 1974) ..... Webster, ND
Betty Lou Griffin (December, 1974) ..... Clinton
James Oscar Hathorn (June, 1974) ..... Kinston
Doris Ruth Jacobs (December, 1974) ..... Raleigh
Mary Grant James (December, 1974) ..... Fayetteville
Sarah Turlington Jones (December, 1974) ..... Pikeville
William Roy Jordan (December, 1974) ..... Spring Lake
Direk Koomman (August, 1974) ..... Chainat, Thailand
Dennis Patrick Levin (August, 1974) ..... Elnora, NY
Lennox Lane McLendon (August, 1974) ..... Eden
Betty Sue Miller (December, 1974) ..... Clinton
Deborah Kravitz Miller (December, 1974) ..... Shallotte
Della Mae Moore (August, 1974) ..... Aurora
Elizabeth Anne Nass (December, 1974) ..... Fayetteville
Thomas Joseph Naughton (December, 1974) ..... Fayetteville
Michael Joseph O'Shea (December, 1974) ..... Pittsburgh, PA
Clifton Parker (December, 1974) ..... Rockingham
Judge Ander Pierce (December, 1974) ..... Reidsville
Charles Edward Pitchford (August, 1974) ..... Fayetteville
Marianne Hull Rothnie (December, 1974) ..... Fairfax, VA
John Frederick William Schulze (December, 1974) ..... Raleigh
Harold Bray Thompson (August, 1974) ..... Fayetteville
Shirley Putman Toney (December, 1974) ..... Forest City
Agnes Peele Vester (December, 1974) ..... Wilson
Phail Wynn, Jr. (December, 1974) ..... Lawton, OK

Agricultural Education

Douglas Ray Best (December, 1974) ..... Mt. Olive
William Charles Braswell (June, 1974) ..... Wadesboro
William Albert Britt (August, 1974) ..... Orrum
Gary Allen Coble (June, 1974) ..... Mamers
Ralph Wayne Cooper (December, 1974) ..... Mt. Airy
Darrell Craig Kiser (June, 1974) ..... Gastonia
Lee-Fen Nancy Lin (December, 1974) ..... Raleigh
Edward Earl Merritt (August, 1974) ..... Garner
Richard Fletcher Pearson (June, 1974) ..... Clinton

Guidance and Personnel Services

William Houston Black (June, 1974) ..... Raleigh
Robin Gray Craven (August, 1974) ..... Roxboro
Dianne Casey Davis (August, 1974) ..... Goldsboro
Mary Janice Edwards (December, 1974) ..... Raleigh
Bonnie Gupton Fleming (December, 1974) ..... Warrenton
Paula Morgan Garber (August, 1974) ..... Marion

Rebecca Warren Hayes (August, 1974) ..... Wilmington, DE
Linda Tilghman Heidgerd (December, 1974) ..... Raleigh
Annette McCormick Melvin (December, 1974) ..... Whiteville
Ralph Harrison Parker (June, 1974) ..... Southpart
Stephanie Kay Pridgen (December, 1974) ..... Snow Hill
Mary Katherine Reese (December, 1974) ..... Smithfield
Robert Lynn Richardson (August, 1974) ..... Barberton, OH
William James Rogers (June, 1974) ..... Warrenton
Martha Branaman Schofield (December, 1974) ..... Raleigh
Catherine Ann Sewell (August, 1974) ..... Sanford
Dallas Otto Tucker, Jr. (June, 1974) ..... Cary
Paul James Tuohig (December, 1974) ..... Raleigh
Phyliss Nutt Womble (December, 1974) ..... Apex

Industrial Arts Education

Deborah Ann Patterson (December, 1974) ..... Greensboro
Richard Eric Peterson (June, 1974) ..... Scotch Plains, NJ
Percy Embry White (June, 1974) ..... Hertford

Mathematics Education

Joyce Ann Anderson (August, 1974) ..... Goldsboro
Ellen Anthe Birch (December, 1974) ..... Raleigh
Patsy Parrish Hester (August, 1974) ..... Nashville
Robert Cathey Overby, Jr. (December, 1974) ..... Roanoke Rapids
Ralph Clark Reynolds (August, 1974) ..... Troy
Linda Davis Whitby (August, 1974) ..... Roanoke Rapids

Occupational Education

Carole Jarrett Anthony (August, 1974) ..... Virginia Beach, VA
Kate E. Berry (August, 1974) ..... Tobaccoville
Richard Lynn Bogart (August, 1974) ..... Imlay City, MI
Donald Ray Brannon (August, 1974) ..... Graham
Jackie Grady Brown (August, 1974) ..... Selma
Mark Dell Harbaugh, Jr. (August, 1974) ..... Mount Jackson, VA
Lyle Eugene Hawkins (August, 1974) ..... Memphis, TN
David Arlin Jones (August, 1974) ..... Angelica, NY
Johnnie Wayne Moore (August, 1974) ..... Staunton, VA
John Darrell Page (August, 1974) ..... Albemarle

Science Education

Anita Hill Bowman (December, 1974) ..... Raleigh
Dianne Watson Goins (August, 1974) ..... Mount Airy
Jimy Lynn Hipps (June, 1974) ..... Valdese

Special Education

Vasudha Gupta (December, 1974) ..... Raleigh

Vocational Industrial Education

Joseph Thurman Amos (December, 1974) ..... Raleigh
Roy Henderson Berry (August, 1974) ..... Tobaccoville
John Murmon Clarkson (December, 1974) ..... Spring Lake

Hiram Newton Coble (June, 1974) .....Burlington
Eugene Scott Driver (December, 1974) .....Dunn
Nicholas Altenberg Hayden (August, 1974) .....Green Valley, IL
Darrell Lee Moody (December, 1974) .....Raleigh
Robert Phillip Nesbit (December, 1974) .....Eden
Algernon Mark Primm, Jr. (August, 1974) .....Mebane
Walter Collins Strickland (August, 1974) .....Cerro Gordo
David Fitzhugh Thompson (December, 1974) .....Raleigh
Donald Ralph Williams (December, 1974) .....Eden
Linda Babb Wright (December, 1974) .....Raleigh

MASTER OF ELECTRICAL ENGINEERING

Gene Stanley Bruner (December, 1974) .....Pocatello, ID
Stephen Dale Moore (December, 1974) .....Red Oak
Harvey Nolan Turner, Jr. (August, 1974) .....Kannapolis

MASTER OF FORESTRY

James Alston Smith (June, 1974) .....Oriental

MASTER OF INDUSTRIAL ENGINEERING

Raul Hernandez (December, 1974) .....Santiago, Dominican Republic

MASTER OF LANDSCAPE ARCHITECTURE

Laurence Stephen Gonia (December, 1974) .....Raleigh
Alice Shear Lepie (December, 1974) .....Raleigh
James McAllister Little (December, 1974) .....Greensboro
Susan Prescott Little (December, 1974) .....Greensboro
William Richard Norris (June, 1974) .....Little Rock, AR
Merle Autrey Powell, Jr. (December, 1974) .....Lexington
Mark Stanley (December, 1974) .....Chicago, IL

MASTER OF LIFE SCIENCES

Janice Robinson Truman (December, 1974) .....Morven

MASTER OF MECHANICAL ENGINEERING

Henry Hall Benner (June, 1974) .....Raymondville, TX
Bachubhai Ramchhodbhia Patel (December, 1974) ....Baroda, Gujarat, India

MASTER OF PRODUCT DESIGN

Robert Thomas Buck (August, 1974).....Raleigh
Yasuhiko Taguchi (December, 1974) .....Yokosuka-Shi, Japan

MASTER OF PUBLIC AFFAIRS

James Breckenridge Blackburn, III (December, 1974) .....Raleigh
William Ray Calloway (December, 1974) .....Raleigh
Robert George Chaudrue (August, 1974) .....Dover, OH
William David Dodson (December, 1974) .....Durham
Thomas Francis Falce (June, 1974) .....Pittsburgh, PA
Joan Meredith Fitting (December, 1974) .....Alexandria, VA

Robert Wayne Gilliland (June, 1974) ..... Arlington, VA
Peaches Gunter (December, 1974) ..... Gastonia
Edward Thomas Hoffman, Jr. (December, 1974) ..... Franklinville, NJ
James Drake James (December, 1974) ..... Mendota, IL
Raymond Arthur Lamont (June, 1974) ..... Richmond, VA
William Edwards Lee (August, 1974) ..... Tampa, FL
Charles Benton Lott (December, 1974) ..... Plant City, FL
Robert Elliot Margolis (August, 1974) ..... Brooklyn, NY
Bennie Gary McGee (August, 1974) ..... Benson
Francis Eugene Parks (December, 1974) ..... San Antonio, TX
Paul Stuart Paskoff (August, 1974) ..... Jamaica, NY
Glenn Julian Payne (August, 1974) ..... Virginia Beach, VA
William Fred Pilkington (August, 1974) ..... Gastonia
Robert Caluya Viduya (August, 1974) ..... Lanai City, HI
Berry Armon Williams, Jr. (December, 1974) ..... Wilmington

MASTER OF RECREATION RESOURCES

Charles Laney Rollins (August, 1974) ..... Henderson

MASTER OF SOCIOLOGY

Omran Salem Etewish (August, 1974) ..... Raleigh
Yevonne Brannon Whitehead (June, 1974) ..... Fayetteville

MASTER OF STATISTICS

Kathryn Adams Council (December, 1974) ..... High Point
David Carter Naftel (August, 1974) ..... Birmingham, AL
David Thomas Register (December, 1974) ..... Star

MASTER OF TECHNOLOGY FOR INTERNATIONAL DEVELOPMENT

Laurence Stroud Carter (June, 1974) ..... Fayetteville

MASTER OF TEXTILE TECHNOLOGY

Robert Allen Price (December, 1974) ..... High Point

MASTER OF URBAN DESIGN

Stephen Hamilton Pratt (December, 1974) ..... Durham

MASTER OF ARTS

Economics

Ray McFall Lamm, Jr. (June, 1974) ..... Wilson

English

Franklin Lamont Lloyd (August, 1974) ..... Sanford
Harold Nicholas Way (December, 1974) ..... Burlington

History

Douglas Carl Abrams (August, 1974) ..... Tarboro

Politics

David Earl Jones (December, 1974) .....Salem, VA

MASTER OF SCIENCE

Animal Science

Paul Lee Craven (December, 1974) .....Thomasville
Henry Wise Webster, III (August, 1974) .....Raleigh

Biological and Agricultural Engineering

Karun Kumar Katur (December, 1974) .....Madras, India
Bharat Shashishekhar Vedak (December, 1974) .....Bombay, India

Botany

William Randall Alsop (December, 1974) .....Northampton, MA
Philip Ford Tomlinson, Jr. (June, 1974) .....West Haven CT

Chemical Engineering

Marvin Randolph Branscome (August, 1974) .....Semora
Kwok-Kuen Li (June, 1974) .....Hong Kong

Chemistry

Charles Joseph Merz, III (December, 1974) .....Old Tappan, NJ
Kei-yi Wei (December, 1974) .....Taipei, Taiwan

Civil Engineering

Speros John Fleggas (December, 1974) .....Charlotte
Sami Hanna Rizkalla (August, 1974) .....Alexandria, Egypt

Crop Science

Kenneth Ray Bateman (June, 1974) .....Columbia
Richard Dale Carringer (August, 1974) .....Gastonia
David Eugene Crews (December, 1974) .....High Point
John Starkie Harden (June, 1974) .....Windsor
Verne Allen Sisson (December, 1974) .....Belvidere, IL

Electrical Engineering

Robert John Boersma (June, 1974) .....Raleigh
Clifton Wells Brown (December, 1974) .....Greensboro
Dean Alexander Glace (June, 1974) .....Elkin
Prakashchandra M. Jain (December, 1974) .....Indore, India
Kuang-Ming Eric Lee (June, 1974) .....Tainan, Taiwan
Gary Conly Messer (December, 1974) .....North Wilkesboro
Domenick Steven Zirpolo (December, 1974) .....New York, NY

Entomology

Richard Graham Andre (December, 1974) .....Ames, IA
Randy Roy Gaugler (December, 1974) .....Madison, WI
Patrick Sheldon Hughes (August, 1974) .....Chapel Hill

John Edgar Hunter, III (August, 1974) ..... Belmont
Marshall Wain Johnson (December, 1974) ..... Charlotte
Nolan Hicks Newton (December, 1974) ..... Bostic
Carol Sullivan Parron (August, 1974) ..... Coldwater, MI

Food Science

Carlos Arturo Arensburg (December, 1974) ..... Begota, Columbia
Beth Devin Eakes (December, 1974) ..... Clinton
Fatemeh Poury Hemmati-Garakani (August, 1974) ..... Tehran, Iran
Kenneth Ray Swartzel (June, 1974) ..... Winston-Salem

Forestry

Mark Edwin Decot (August, 1974) ..... Cary
George Graham Glass, Jr. (August, 1974) ..... Raleigh
Hilliard Walker Kirby (June, 1974) ..... Asheville
Kowit Sombun (December, 1974) ..... Kanchanaburi, Thailand

Genetics

Robert Michael Petters (December, 1974) ..... Ephrata, PA
Raymond John Zimmerman, III (December, 1974) ..... Millville, NJ

Geology

Bruce Warren Harvey (June, 1974) ..... Concord

Guidance and Personnel Services

Mary Clark Whitton (August, 1974) ..... Charlotte

Industrial Arts Education

Paul Maxwell Killough (June, 1974) ..... Chapel Hill

Industrial Engineering

Thomas Frank Cecich (December, 1974) ..... Cary

Marine Sciences

John Holden Boone (December, 1974) ..... Mt. Airy
John Henry Crouch (June, 1974) ..... Hickory
Thomas Jeffrey French (August, 1974) ..... Aiken, SC
John Shearer Irwin (December, 1974) ..... College Park, MD
Jane Elizabeth Kogelschatz (August, 1974) ..... Martinsburg, WV
William Bailey Petersen (December, 1974) ..... Charlotte
Michael Richard Riches (June, 1974) ..... Richland, WA

Materials Engineering

Thomas Greeley Cuningham (December, 1974) ..... Monroe
Maria-Luise Fiedler (December, 1974) ..... Dessau, Germany

Mechanical Engineering

Lotfy Labib Saleh (December, 1974) ..... Charlotte
Noral Devarner Stewart (December, 1974) ..... Mocksville
Kenneth James Weilmuenster (December,1974) ..... Yorktown, VA

Microbiology

Boonbungearn Boonchuvit (December, 1974) .....Samudprakarn, Thailand
Karen Robinson Dail (December, 1974) .....Cullowhee
Thomas Anthony Kost (December, 1974) .....Forest City, PA
Albert Keith Kuhne (December, 1974) .....Bakersville
Marvin Edward Osborne, Jr. (December, 1974) .....West Jefferson
Robert Gregory Upchurch (December, 1974) .....Raleigh

Nuclear Engineering

P. M. Abraham (December, 1974) .....Raleigh
John Mark Mintz (December, 1974) .....Mocksville
Charles Levi Nofziger (December, 1974) .....Sarasota, FL
Robert James Veklotz (August, 1974) .....Angola, NY

Nutrition

Felix Earl Grissom (June, 1974) .....Louisburg

Operations Research

Michael Ross Austin (December, 1974) .....Marshville
Supoch Kosiyachinda (December, 1974) .....Bangkok, Thailand
Jerry Shelton Worley (December, 1974) .....Micro

Physics

Arthur Cecil Ball (August, 1974) .....Raleigh
LeRoy Joseph Boudreau, II (June, 1974) .....Brookfield, IL
James Caldwell Cochrane, Jr. (December, 1974) .....Charlotte
David Malcolm Dunbar (December, 1974) .....Morrow, GA
Sydney Jeter Gordon (August, 1974) .....Richmond, VA
James Daniel Phillips (June, 1974) .....Greenville, SC
Robert Neal Sane (June, 1974) .....Rutherfordton
William Preston Sellers (June, 1974) .....Sanford

Physiology

Larry Albert Cogburn, III (August, 1974) .....Canton

Plant Pathology

Stanley Theodore Hoffman (August, 1974) .....Huntingdon, PA
Stephen Arthur Johnston (August, 1974) .....Penns Grove, NJ
Sandra Kay Walker (December, 1974) .....Fallston

Psychology

Anne Eileen Buchanan (December, 1974) .....Chapel Hill

Rural Sociology

Earl Dixon Beshears (August, 1974) .....Durham
Eric Hoffman (December, 1974) .....Cleveland, OH
Albert Elliot Luloff (June, 1974) .....Oceanside, NY
Kathy Wagner Props (June, 1974) .....Lewisville
Stanley Richard Smedley, Jr. (December, 1974) .....Shelby

Soil Science

Alfredo Alvarado (August, 1974) .....San Jose, Costa Rica
Somchai Khomvilai (December, 1974) .....Bangkok, Thailand
Fernando Munevar (December, 1974) .....Bogota, Columbia
Pedro Raul Solorzano (December, 1974) .....Valencia, Venezuela

Textile Technology

Christopher James Blumer (December, 1974) ....Cheltenham, Glos, England
Trevor Charles Rhodes (June, 1974) .....Leicester, England
Dinesh Kumar Gupta (December, 1974) .....Delhi, India
Meyyappan Venkatesan (August, 1974) .....Madras, India

Wood and Paper Science

Bruce Jeffrey Thoman (June, 1974) .....Naperville, IL

Zoology

Leon Matthew Cammen (December, 1974) .....Corning, NY
Joseph Henry Carter, III (December, 1974) .....Southern Pines
Larry Ray Grimes (August, 1974) .....Fayetteville
Parke Alstan Rublee (December, 1974) .....Orchard Park, NY
Stephen Paul Walker (August, 1974) .....Palo Alto, CA

Doctor of Education Degrees

Nathaniel Creighton Alexander, Industrial Arts Education
Cary, North Carolina (August, 1974)
Dissertation: A National Identification and Classification of Some Professional Problems that Confront the Neophyte Industrial Arts Teacher. (Under the direction of Delmar W. Olson).

Patricia Andrews Ashley, Occupational Education
Mt. Airy, North Carolina (December, 1974)
Dissertation: The Effect of Group Counseling on the Self-Concept of High School Females. (Under the direction of Charles G. Morehead).

Robert Joseph Atkins, Industrial Arts Education
Union, New Jersey (August, 1974)
Dissertation: A Comparative Study of the Purposes of Industrial Arts Education. (Under the direction of Delmar W. Olson).

George Miller Britton, Adult and Community College Education
Charlotte, North Carolina (December, 1974)
Dissertation: Correctional Facility Inmate Rule Violation as a Function of Opportunity Structure. (Under the direction of Edgar J. Boone).

Jack F. Cherry, Adult and Community College Education
Washington, North Carolina (August, 1974)
Dissertation: An Analysis of Selected Variables Related to Achievement Motivation of Students Enrolled at Beaufort County Technical Institute. (Under the direction of Edgar John Boone).

James William Cole, Jr., Adult and Community College Education
Lenoir, North Carolina (August, 1974)
Dissertation: The Effect of Adult Student Participation in Classroom Program Planning on Achievement, Retention, and Attitude. (Under the direction of J. Conrad Glass, Jr. and Curtis Trent).

Donald Harrison Hessenflow, Adult and Community College Education
Fremont, Nebraska (August, 1974)
Dissertation: Faculty Participation in Administrative Decision-Making Activities in the North Carolina Community College System. (Under the direction of G. E. Parsons).

David Ruble Hill, Occupational Education
Washington, Pennsylvania (August, 1974)
Dissertation: Implications of the Year-Round School Concept for Secondary Area Occupational Centers. (Under the direction of Joseph T. Nerden).

Jane Porterfield Janey, Occupational Education
Newport, Virginia (August, 1974)
Dissertation: An Analysis of the Impact of a Federally Assisted Vocational Facility Project in a Selected Community. (Under the direction of John K. Coster).

Susan Grey Kelly, Adult and Community College Education
Tabor City, North Carolina (December, 1974)
Dissertation: Educational Participation Patterns of Older Adults. (Under the direction of J. Conrad Glass, Jr. and Edgar J. Boone).

John Howard O'Connell, Adult and Community College Education
Wilson, North Carolina (June, 1974)
Dissertation: Delphi Assistance to Administration: The Development and Testing of an Aid to Educational Decision Making. (Under the direction of Ronald W. Shearon).

Napoleon Jerome Owens, Jr., Occupational Education
Greensboro, North Carolina (June, 1974)
Dissertation: A Study to Determine the Predictive Validity of Admissions Criteria for Dental Hygiene Programs in the Community College System of North Carolina. (Under the direction of Durwin M. Hanson).

Robert Francis Paugh, Occupational Education
Youngstown, Ohio (August, 1974)
Dissertation: The Development and Validation of a Model for Personnel Management in Local Education Agencies. (Under the direction of John K. Coster).

Harriet Perlstein Rosenthal, Adult and Community College Education
Fayetteville, North Carolina (December, 1974)
Dissertation: The Effect of Teacher Expectancy upon the Achievement and Intelligence Test Scores of Adult Students. (Under the direction of J. Conrad Glass, Jr. and Curtis Trent).

Alice Ida Tetreault, Adult and Community College Education
Providence, Rhode Island (December, 1974)
Dissertation: An Analysis of Selected Factors Associated with Professional Attitude of Nursing Students in a Baccalaureate Program. (Under the direction of Curtis Trent).

Leonard Edward Thomas, Adult and Community College Education
Calgary, Alberta, Canada (December, 1974)
Dissertation: Listening as an Adjunct to Remedial Reading at the Junior-Community College Level. (Under the direction of G. E. Parsons and Edgar J. Boone).

Hazel Garris Tripp, Occupational Education
Raleigh, North Carolina (December, 1974)
Dissertation: The Development and Evaluation of a Programmed Occupational Information Unit on Construction Occupations Entitled Opportunities in Construction Occupations. (Under the direction of Durwin M. Hanson).

Doctor of Philosophy Degrees

William Clay Adams, Jr., Electrical Engineering
Trenton, North Carolina (August, 1974)
Dissertation: A New Method of Determining the Performance of Delta Modulation Systems. (Under the direction of John B. O'Neal, Jr.).

Carlos Arturo Baanante, Economics
Trujillo, Peru (June, 1974)
Dissertation: Andean Group Economic Integration: The Case of the Nitrogenous Fertilizer Industry. (Under the direction of R. L. Simmons).

Frederick Charles Baker, Biochemistry
Wallsend-on-Tyne, England (August, 1974)
Dissertation: Biohydrogenation of Unsaturated Fatty Acids: Partial Purification and Properties of *Cis*-9, *Trans*-11-Octadecadienoic Acid *Cis* Reductase from *Butyrivibrio fibrisolvens*. (Under the direction of Samuel B. Tove).

John Edward Baker, Industrial Engineering
Los Angeles, California (August, 1974)
Dissertation: An Experimental Investigation of the Suppression of Sinus Arrhythmia as an Indicator of Mental and Physical Strain. (Under the direction of Rolin F. Barrett and Stanley M. Soliday).

Rodney Carlyle Baker, Physiology
Teasdale, Utah (August, 1974)
Dissertation: Interactions Between the Hepatic Microsomal Mixed-Function Oxidase Enzyme System and Pesticides. (Under the direction of Ernest Hodgson).

Boyce Burton Balfour, II, Economics
Lindale, Texas (December, 1974)
Dissertation: Spatial Planning and Analysis of the Location of Public School Facilities. (Under the direction of Richard A. King).

Michael Joseph Baranski, Botany
Wheeling, West Virginia (August, 1974)
Dissertation: An Analysis of Variation Within White Oak (*Quercus alba* L.). (Under the direction of James W. Hardin).

Timothy Joseph Bechtel, Zoology
Long Island, New York (December, 1974)
Dissertation: A Mathematical Model of the Fate of a Single Dose of Dieldrin in an Estuarine Microcosm. (Under the direction of Billy Joe Copeland).

Gulgunji Ramachandra Bhat, Fiber and Polymer Science
Mangalore, India (December, 1974)
Dissertation: Characterization of Nyon 66-Poly(ethylene Glycol) Blend Fibers. (Under the direction of Solomon P. Hersh).

Thelma Jean Blocker, Sociology
Hot Springs, Arkansas (December, 1974)
Dissertation: Status Inconsistency and Differential Fertility. (Under the direction of James N. Young and Adam C. Davis).

Carl Francis Bloemker, Nuclear Engineering
Philadelphia, Pennsylvania (June, 1974)
Dissertation: Multiple Input Noise Analysis of a Commercial Power Reactor. (Under the direction of Raymond F. Saxe).

Gary Marvin Brady, Mathematics
Newton, North Carolina (December, 1974)
Dissertation: Results on (E,BE)-compactness and (E,BE)-compactifications. (Under the direction of Richard E. Chandler).

Vinton Charles Bruton, Botany
Fremont, North Carolina (December, 1974)
Dissertation: Environmental Influences on the Growth of *Arabidopsis thaliana*. (Under the direction of Charles E. Anderson).

Clyde Dale Buckner, Civil Engineering
Baton Rouge, Louisiana (June, 1974)
Dissertation: Optimization of Regular Structural Lattices. (Under the direction of John F. Ely).

David DeVaney Chapman, Forestry and Statistics
Arlington, Virginia (June, 1974)
Dissertation: An Extension and Investigation of the Properties of the Ridge Estimator. (Under the direction of William L. Hafley and Robert J. Monroe).

Harry Benjamin Collins, Crop Science
Morristown, New Jersey (August, 1974)
Dissertation: The Nature and Inheritance of Anthracnose (*Colletotrichum trifolii*(Bain & Essary)) Resistance in Alfalfa, *Medicago sativa* L. (Under the direction of Thad H. Busbice).

Linda Anne Corey, Genetics
Loyalhanna, Pennsylvania (December, 1974)
Dissertation: An Evaluation of Maternal and Reciprocal Effects by Diallel Analyses of Seedling Characters in *Arabidopsis thaliana* (L.) Heynah. (Under the direction of Dale F. Matzinger).

Armand Corriveau, Genetics
Ste-Foy, Quebec, Canada (December, 1974)
Dissertation: The Clonal Performance of Loblolly and Virginia Pines, a Reflection of Their Breeding Value. (Under the direction of Bruce J. Zobel).

Hatice Sadan Cullingford, Chemical Engineering
Konya, Turkey (December, 1974)
Dissertation: Modeling Porous Media by the Method of Diakoptics.(Under the direction of James K. Ferrell).

Donald Vetsel DeBord, Economics
West Chester, Ohio (December, 1974)
Dissertation: Demand For and Cost of Salt Marsh Mosquito Abatement. (Under the direction of G. A. Carlson and W. D. Toussaint).

Romero Marinho De Moura, Plant Pathology
Recife, Pernambuco, Brazil (August, 1974)
Dissertation: Disease Complexes in Tomato Involving *Meloidogyne incognita*, Tobacco Mosaic Virus (Tomato Strain) and Two Races of *Fusarium oxysporum* f. *lycopersici*. (Under the direction of Nathaniel T. Powell).

James Edward Easley, Jr., Economics
Walnut Cove, North Carolina (June, 1974)
Dissertation: Expenditures per Child in an Economic Model of Fertility. (Under the direction of B. L. Gardner and D. M. Hoover).

George Arthur Ecker, Economics
Mansfield, Connecticut (June, 1974)
Dissertation: Optimal Replacement Pattern of Standard Apple Trees with Dwarfs. (Under the direction of W. D. Toussaint and R. K. Perrin).

Richard Reed Edwards, Economics
Hemlock, New York (August, 1974)
Dissertation: Estimating the Demand for Cable Television. (Under the direction of T. Dudley Wallace).

James Ian Elliott, Biochemistry
Seattle, Washington (December, 1974)
Dissertation: The Multiple Conformational Forms of Alcohol Dehydrogenase from *Drosophila melanogaster*. (Under the direction of James A. Knopp).

James William Evans, Statistics
Raleigh, North Carolina (August, 1974)
Dissertation: Computer Generated D-Optimal, V-Optimal and Trace Optimal Minimum Bias Experimental Designs. (Under the direction of Allison R. Manson and Robert G. D. Steel).

Claude Herman Farrell, III, Economics
Wilmington, North Carolina (December, 1974)
Dissertation: Forced Busing and the Demand for Schooling. (Under the direction of L. A. Ihnen and David N. Hyman).

Donald Charles Forester, Zoology
Waco, Texas (December, 1974)
Dissertation: Parental Care in *Desmognathus ochrophaeus* Cope (Urodela: Plethodontidae): A Behavioral Study. (Under the direction of Bernard S. Martof).

Robert Patrick Gambrell, Soil Science
Westminster, South Carolina (August, 1974)
Dissertation: Nitrogen Losses from Cultivated Soils of the North Carolina Coastal Plain. (Under the direction of James W. Gilliam).

Suhas Ramkrishna Ghate, Biological and Agricultural Engineering
Chalisgaon, Maharashtra, India (December, 1974)
Dissertation: Vibrational Characteristics of a Two-Branch Blueberry Cane. (Under the direction of Roger P. Rohrbach and Ervin G. Humphries).

DeWitt Talmadge Gooden, III, Crop Science and Soil Science
Elizabethtown, North Carolina (December, 1974)
Dissertation: Effects of Management Systems, Varieties, and Planting Dates on Yield, Quality, and Chemical Properties of Flue-Cured Tobacco. (Under the direction of Raymond C. Long and Willie G. Woltz).

Michael Jerome Goodman, Psychology
Raleigh, North Carolina (August, 1974)
Dissertation: The Combined Effects of Noise and Vibration on Human Annoyance. (Under the direction of Richard G. Pearson).

Rakesh Kumar Gupta, Fiber and Polymer Science
Delhi, India (December, 1974)
Dissertation: On the Mechanics of Pseudoplastic Polymeric Fluid Flow through Straight and Converging Spinneret Geometries. (Under the direction of Aly H. M. El-Shiekh).

Julie Williams Harris, Physiology
Wheeling, West Virginia (August, 1974)
Dissertation: Effects of Estrogen on Uterine Utilization of Pyruvate for Lipid Synthesis. (Under the direction of Donald E. Smith).

Randall Edward Harris, Genetics
Kearney, Nebraska (December, 1974)
Dissertation: On the Control and Inheritance of Prolificacy in *Zea mays* (L.). (Under the direction of Robert H. Moll).

Ernest Harrison, Jr., Materials Engineering
Jackson, Mississippi (June, 1974)
Dissertation: Electrical Characteristics of a Lead Silicate Glass. (Under the direction of Robert F. Stoops).

Charles Ned Harward, Physics
Raleigh, North Carolina (August, 1974)
Dissertation: Investigation of Spectral Line Parameters of CO_2 and N_2O by Using CO_2 and N_2O Laser Sources. (Under the direction of Richard R. Patty).

Peter Jacob Hauser, Chemistry
Kings Mountain, North Carolina (December, 1974)
Dissertation: Magnetic Circular Dichroism and Other Studies of Several Chromium and Indium Complexes. (Under the direction of Anton F. Schreiner).

Regine Eugenia Hay, Genetics
Atlanta, Georgia (December, 1974)
Dissertation: Biochemical Characterization of Allelic Forms of Soluble Malate Dehydrogenase of *Drosophila melanogaster*. (Under the direction of Frank B. Armstrong).

James Vincent Higgins, Economics
Galway, Ireland (December, 1974)
Dissertation: An Analysis of Family Labor Supply in Rural Areas. (Under the direction of Dale M. Hoover).

Robert Alden Howland, Jr., Engineering Science and Mechanics
Rosemont, Pennsylvania (December, 1974)
Dissertation: An Accelerated Elimination Technique for the Solution of Perturbed Hamiltonian Systems. (Under the direction of Clarence J. Maday and J. M. Anthony Danby).

Pe-Hwa Luh Hsiung, Fiber and Polymer Science
Raleigh, North Carolina (December, 1974)
Dissertation: Study of Interaction of Organic Liquids with Polyethylene Terephthalate by Means of Gas Chromatography. (Under the direction of David M. Cates).

Fereydoun Jalali, Electrical Engineering
Raleigh, North Carolina (August, 1974)
Dissertation: Relationship Between Surface Resistance of Copper and Surface Roughness at Millimeter Wavelengths. (Under the direction of Frederick J. Tischer).

Walter Donald Johnson, Mechanical Engineering
Buies Creek, North Carolina (August, 1974)
Dissertation: Unsteady Momentum Integral Analysis of the Laminar Boundary Layer on an Elliptic Cylinder Oscillating in Pitch. (Under the direction of James C. Williams, III)

Lynn Arthur Jones, Nutrition
Lexington, Massachusetts (June, 1974)
Dissertation: Effects of Gossypol on the Intestinal Absorption of Amino Acids in the Rat. (Under the direction of Frank H. Smith).

Gregory Alan Kew, Chemistry
Burlington, Vermont (August, 1974)
Dissertation: Electrochemical Investigations on Rhodium 2,2′-Bipyridine and 1,10-Phenanthroline Complexes. (Under the direction of M. Keith DeArmond).

Robert George Kratsas, Genetics
Pittsburgh, Pennsylvania (December, 1974)
Dissertation: The Action of Alanosine on the Reproductive Performance of *Habrobracon* (*Bracon hebetor*) and Three Other Species (*Phormia regina, Artemia salina* and *Mus musculus*). (Under the direction of Daniel S. Grosch).

Dennis Joseph Kulonda, Industrial Engineering and Economics
Pottsville, Pennsylvania (December, 1974)
Dissertation: An Automative Emissions Policy Simulator with Illustrative Application to the Analysis of Costs and Benefits of Waiting for Improved Control Technology. (Under the direction of Robert W. Llewellyn and E. W. Erickson).

Keith Lee Kushman, Mechanical Engineering
Cary, North Carolina (December, 1974)
Dissertation: Unsteady Stall of a Slender Elliptic Cylinder in a Free-stream of Sinusoidally Varying Angle of Incidence. (Under the direction of James C. Williams, III).

Darshan Lal, Biological and Agricultural Engineering
Meerut, India (December, 1974)
Dissertation: The Influence of Porosity on the Monochromatic Emittance and Freeze-Drying Characteristics of Cured Tobacco Shreds. (Under the direction of William H. Johnson).

Chong-kwang Liao, Mechanical Engineering
Taichung, Taiwan (December, 1974)
Dissertation: Thermal Capacitor Design Rationale. (Under the direction of John A. Bailey).

Edward Richardson Long, Jr., Physics
Hampton, Virginia (June, 1974)
Dissertation: Uncoupled Hartree-Fock Calculations of Magnetic Susceptibilities and Current Density Calculations of Chemical Shifts From Pi-Electrons in Polycyclic Aromatic Hydrocarbons. (Under the direction of Jasper D. Memory).

Thomas Kenneth Louton, Biomathematics
Woodstock, Illinois (June, 1974)
Dissertation: A Mathematical Study of Non-Communitative Probability Theory. (Under the direction of Ronald O. Fulp).

Harsh Kumar Manaktala, Materials Engineering
Raleigh, North Carolina (December, 1974)
Dissertation: The Crystal Structure of Stoichiometric $CoIn_2$ Intermetallic Compound in the Binary Cobalt-Indium System. (Under the direction of Hans H. Stadelmaier).

Douglas Keith Marvil, Nutrition
Laurel, Delaware (June, 1974)
Dissertation: Changes in Milk Composition Associated with the Estrous Cycle of the Bovine. (Under the direction of Evan E. Jones).

Ramesh Kumar Mathur, Materials Engineering
Raleigh, North Carolina (December, 1974)
Dissertation: Magnetic Properties of Cubic Borides. (Under the direction of Hans H. Stadelmaier).

Dimitrios Ioannis Matziris, Forestry
Athens, Greece (August, 1974)
Dissertation: Predicted versus Realized Gain in Loblolly Pine (*Pinus taeda* L.) Improvement. (Under the direction of Bruce J. Zobel).

John Thomas May, Physics
Chalfont, Pennsylvania (June, 1974)
Dissertation: A Triple Coincidence Study of the Particle Spectrum Associated with K-Shell Electron Shake-Off in the Decay of ^{204}Tl. (Under the direction of Arthur W. Waltner).

Charles Wilbur Mayo, Nuclear Engineering
Newport News, Virginia (December, 1974)
Dissertation: Spectral and Correlation Analysis for Malfunction Diagnosis in a Nuclear Power System. (Under the direction of Raymond F. Saxe).

Humberto Alfredo Mendoza, Genetics
Lima, Peru (June, 1974)
Dissertation: Genetics of Photoperiodic Behavior in Tuber-Bearing *Solanum*. (Under the direction of Frank L. Haynes).

John Wayne Mishoe, Biological and Agricultural Engineering
Loris, South Carolina (December, 1974)
Dissertation: Dynamic Modeling of the Human Hand Using Driving Point Mechanical Impedance Technique. (Under the direction of Charles W. Suggs).

Jerald LeGrand Nelson, Economics
Salt Lake City, Utah (December, 1974)
Dissertation: Taxation and Other Economic Effects on the Capital Structure of Farm Supply Cooperatives. (Under the direction of E. W. Erickson and P. R. Johnson).

Douglas Alvin Outlaw, Physics
Kinston, North Carolina (December, 1974)
Dissertation: A High-Resolution Study of Proton Resonances in ^{31}p, ^{35}Cl, and ^{93}Tc. (Under the direction of Gary E. Mitchell).

Rajendra Kumar Pachauri, Industrial Engineering and Economics
Meerut, India (December, 1974)
Dissertation: A Dynamic Model for Forecasting of Electrical Energy Demand in a Specific Region Located in North and South Carolina. (Under the direction of Robert W. Llewellyn).

Gerald Franklin Peedin, Soil Science
Pine Level, North Carolina (August, 1974)
Dissertation: Investigations on the Calcium Requirements of Flue-Cured Tobacco and Factors Related to Varietal Susceptibility to Calcium Deficiency. (Under the direction of Charles B. McCants).

Horace Randolph Perry, Jr., Zoology
Colerain, North Carolina (December, 1974)
Dissertation: Trap Responses of the Gray Squirrel (*Sciurus carolinensis carolinensis*), Raccoon (*Procyon lotor lotor*), and Opossum (*Didelphis virginiana virginiana*) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina. (Under the direction of Garland B. Pardue and Frederick S. Barkalow, Jr.).

Janakiramaiah Potukuchi, Electrical Engineering
Brodipet, India (June, 1974)
Dissertation: An Experimental and Theoretical Investigation of Beam Waveguides at Millimeter Wavelengths. (Under the direction of Frederick J. Tischer).

Thomas Shaw Powell, Animal Science
High Springs, Florida (December, 1974)
Dissertation: Nutritional and Managerial Restriction Regimes for Broiler Breeder Pullets and Cockerels. (Under the direction of Marvin H. Gehle and Elliott R. Barrick).

Moncompu Narayanaswami Prasad, Crop Science
Kumbakonam, Tamilnadu, India (December, 1974)
Dissertation: Inheritance of and Environmental Effects upon the Expression of Barley Stripe Disease Incited by *Helminthosporium gramineum* Rabh. (Under the direction of Charles F. Murphy).

George Bruce Rampacek, Physiology
Bowie, Maryland (December, 1974)
Dissertation: Investigations into Reproduction in the Prepuberal Gilt, the Early-weaned Sow and Uterine Capacity in the Female Pig. (Under the direction of Lester C. Ulberg).

John Arthur Riccobono, Psychology
Raleigh, North Carolina (December, 1974)
Dissertation: Occupational Clusters Formed on the Basis of Systematically Derived Work Dimensions: An Exploratory Study. (Under the direction of John W. Cunningham).

Fuad Akil Rihani, Civil Engineering
Al-Husn, Jordan (August, 1974)
Dissertation: A Model for Selecting the Optimum Number, Size and Location of Highway Maintenance Yards. (Under the direction of J. William Horn and Saleh E. Elmaghraby).

Robert Dell Rogers, Social Science
Rexburg, Idaho (December, 1974)
Dissertation: Various Aspects of Sludge Degradation. (Under the direction of Arthur G. Wollum).

Aziz Roozbazar, Industrial Engineering
Abadan, Iran (December, 1974)
Dissertation: A Work Physiology Study of Lifting. (Under the direction Mahmoud A. Ayoub and Robert W. Llewellyn).

Parviz Samar, Civil Engineering
Teheran, Iran (June, 1974)
Dissertation: An Evaluation of the Effectiveness and Applicability of Physical Chemical Treatment of Urban Land Runoff. (Under the direction of Newton V. Colston and William S. Galler).

Walter Charles Shortle, Jr., Plant Pathology
Laconia, New Hampshire (December, 1974)
Dissertation: Development of Discoloration and Decay in Living Sweetgum and Yellow-Popular Trees. (Under the direction of Ellis R. Cowling).

David Sylva Shriner, Plant Pathology
Spokane, Washington (December, 1974)
Dissertation: Effects of Simulated Rain Acidified with Sulfuric Acid on Host-Parasite Interactions. (Under the direction of Ellis B. Cowling and Allen S. Heagle).

Donald Wayne Stanley, Zoology
Kernersville, North Carolina (December, 1974)
Dissertation: Production Ecology of Epipelic Algae in Alaskan Tundra Ponds. (Under the direction of B. J. Copeland and John E. Hobbie).

Robert Stuart Steele, Engineering Science and Mechanics
Hickory, North Carolina (December, 1974)
Dissertation: A New Experimental Method and Technique for Determining Dynamic Stresses During Axial Wave Propagation in Rods. (Under the direction of Robert A. Douglas).

Clifford Yi-Der Tai, Chemical Engineering
Taipei, Taiwan (December, 1974)
Dissertation: Contact Nucleation of Various Crystal Types. (Under the direction of Ronald W. Rousseau).

Sampe Tonapa, Soil Science
Makassar, Indonesia (August, 1974)
Dissertation: Nitrogen Studies with Histosols. (Under the direction of Eugene J. Kamprath).

David Harris Vaughan, Biological and Agricultural Engineering
Oxford, North Carolina (December, 1974)
Dissertation: A Simulation of Cotton Radicle Growth During Emergence. (Under the direction of Henry D. Bowen).

Gerald David Walberg, Mechanical Engineering
Hampton, Virginia (December, 1974)
Dissertation: Analysis of a Wall-Stabilized-Arc Discharge Generator with Three-Dimensional, Nongrey Radiation Transport. (Under the direction of Hassan A. Hassan).

Stanley Milfred Warlen, Zoology
Morehead City, North Carolina (December, 1974)
Dissertation: Accumulation and Retention of DDT by Atlantic Menhaden, *Brevoortia tyrannus*. (Under the direction of William W. Hassler and Douglas A. Wolfe).

William Franklin Watson, Jr., Forestry and Statistics
Tifton, Georgia (December, 1974)
Dissertation: Estimation on Restricted Parameter Spaces. (Under the direction of Benee F. Swindel and Hubertus R. van der Vaart).

Steve Russell Webster, Soil Science
Centralia, Washington (December, 1974)
Dissertation: Nutrition of Seed Orchard Pine in Virginia. (Under the direction of Charles B. Davey).

Tommy Ray Willard, Nutrition
Liberty, North Carolina (December, 1974)
Dissertation: Release of Trypsin Inhibitor from Fully-Cooked Soy Flour and Its Effect on the Growth of Newborn Calves. (Under the direction of Harold A. Ramsey).

John Robert Williams, Jr., Physics
Albany, Georgia (December, 1974)
Dissertation: A Study of the Electromagnetic Decay of the Low-Lying Excited States in ^{29}Al and ^{61}Ni. (Under the direction of David R. Tilley and Christopher R. Gould).

Ray Lynn Winstead, Zoology
Wilson, North Carolina (December, 1974)
Dissertation: Local Movement of Birds in Winter in a Suburban Environment. (Under the direction of Thomas L. Quay).

William Lawrence Wissinger, Genetics
Sault Ste. Marie, Michigan (December, 1974)
Dissertation: The Effects of the Selected Juvenile Hormone Analogues on Fecundity and Fertility in *Habrobracon juglandis*. (Under the direction of Daniel S. Grosch).

William Woodrow Witt, Crop Science
Fletcher, Oklahoma (August, 1974)
Dissertation: Ethylene Adsorption and Movement in Soils and Soil Constituents. (Under the direction of Jerome B. Weber).

Roger Dale Wyatt, Microbiology
Albemarle, North Carolina (August, 1974)
Dissertation: *Candida albicans* Infections in Avians. (Under the direction of Pat B. Hamilton).

John Carl Wozny, Chemistry
Toledo, Ohio (June, 1974)
Dissertation: Photodifluoramination of Imines and Nitriles. (Under the direction of Carl L. Bumgardner).

Mary Ellen Wozny, Biochemistry
Toledo, Ohio (June, 1974)
Dissertation: Regulation of Agrinine Biosynthesis in *Escherichia coli* W. (Under the direction of Evan E. Jones).

Yuji Yamasue, Crop Science
Kyoto, Japan (June, 1974)
Dissertation: Foliar Effects on Tobacco (*Nicotiana tabacum* L.) of Benefin (*N*-butyl-*N*-ethyl-*a,a,a*-trifluoro-2,6-dinitro-*p*-toluidine) Vaporizing from Soils. (Under the direction of Arch D. Worsham).

Chester Edwin Young, Jr., Economics
Rimersburg, Pennsylvania (December, 1974)
Dissertation: Economic Analysis of Municipal Wastewater Treatment Systems. (Under the directions of G. A. Carlson and E. C. Pasour).

Gilroy Joel Zuckerman, Economics
Schenectady, New York (December, 1974)
Dissertation: An Economic Study Concerned with the Valuation of Human Life in Court Cases Involving the Accidental Death of Females. (Under the direction of T. D. Wallace).

Recipient of
HONORARY DEGREE

John Tyler Caldwell

There is sometimes a case, and this is one, when the bare bones of the record completely fail their purpose. There is, of course, the Mississippi boyhood, the Ph.D. from Princeton, the succession of presidencies, the honorary degrees — no one of these, nor all of them together, tell the story of the man whom now we hail, even as we say farewell.

What really comes to mind at this moment is the fact of leadership within and without during our time of growth both in numbers and in interests; the enlargement of incentive for excellence; the transmission of the benefits of the University to those we serve; the encouragement of the acquisition of knowledge and its translation into terms that might guide the growth of the individual as well as that of the State and the world beyond.

Above all, you have kept the course. Through the agonies of the war and its impact on the students; through the immense changes of the civil rights movement; in those dark moments of history when stalked the assassin; your response to crisis revealed the quality of the man and we are glad you were with us.

Therefore, JOHN TYLER CALDWELL, upon the recommendation of the faculty of this University, and by vote of the Board of Trustees of North Carolina State University at Raleigh, we confer upon you the Degree of Doctor of Laws, *honoris causa.*

And now, while we offer you our highest honor, we also say goodbye. Hail, John, and farewell! Hail and farewell.

ALUMNI DISTINGUISHED PROFESSORSHIPS

Name	*School*	*Term*
Charles D. Livengood Associate Professor	Textiles	1975-1976
Hubert V. Park Professor of Math and Associate Dept. Head PAM	Physical & Mathematical Sciences	1975-1977
Maurice G. Cook Professor	Agriculture & Life Science	1975-1978
Robert G. Hitchings Professor	Forest Resources	1975-1978
Paul D. Cribbins Professor	Engineering	1975-1978

OUTSTANDING TEACHER AWARDS

Name	*School*
George H. Blessis Associate Professor	Engineering
Gene J. Galletta Professor	Agriculture & Life Science
Joseph P. Hobbs Associate Professor	Liberal Arts
Harold B. Hopfenberg Professor	Engineering
Michael A. Littlejohn Associate Professor	Engineering
Bernard S. Martof Professor	Agriculture & Life Science
Lawrence E. Mettler Professor	Agriculture & Life Science
Carmen R. Parkhurst Associate Professor	Agriculture & Life Science
William P. Pinna Assistant Professor	Liberal Arts
Jay W. Randle Assistant Professor	Design
Thomas H. Regan Associate Professor	Liberal Arts
William H. Spence Associate Professor	Physical & Mathematical Sciences
Donald H. J. Steensen Associate Professor	Forest Resources
H. Robert van der Vaart Professor	Physical & Mathematical Sciences

Awards for Achievement 1974-1975

SCHOOL OF AGRICULTURE AND LIFE SCIENCES

Agricultural Council Outstanding Club Member Awards
Agricultural Institute: William P. Crawley, Jr., New London
Agronomy: Clarence Vance Greeson, Burlington
Animal Science: Grace Gordon Greenlee, Marion
Biological and Agricultural Engineering: Henry Clifton Sink, Jr., Lexington
Food Science: Deborah Bell Leverton, Whispering Pines
Horticulture: Melinda J. Henson, Denton
Poultry Science: Robert Barber Cashion, Statesville
Pre-Veterinary: William Bernard Toole, Jr., Charlotte
Pre-Medical and Pre-Dental: Keith Alan Yount, Hickory
Wildlife Biology: Douglas Keith Moody, Basking Ridge, New Jersey

Agronomy:
Senior Highest Scholastic Average in Agronomy: Douglas J. Thomas, Cleveland, Ohio
American Society of Agronomy Award, Most Outstanding Senior: Roy Lee Mathis, Roaring River
Agronomy Club Leadership Award: Clarence Vance Greeson, Burlington

Animal Science:
Most Outstanding Club Member: Deborah Melin Fletcher, Durham
Most Outstanding Senior: E. Reid Ledbetter, Shelby

Biological and Agricultural Engineering:
American Society of Agricultural Engineers, Senior Honor Award: Donnie Ray Ellis, Garner
Agricultural Engineering Technology Club, Senior Honor Award: Ray Kearney Pleasant, Angier

Food Science:
B. M. Newell Award: Sabra Carolyne DeVaun, Raleigh
Most Outstanding Senior: Gerald Garland Roney, Durham

Gamma Sigma Delta:
Senior Certificate: William Roy Sanders, Raleigh

Horticultural Science:
Burpee Award: Mary Cristina Warren, Candler
Outstanding Senior Horticulturist Award: Douglas Wade Carrigan, Mooresville

Zoology:
Most Outstanding Students: Suzanne Smith, Albuquerque, New Mexico; Jerry Michael Foster, Newton

SCHOOL OF DESIGN

The American Institute of Architects School Medal: Harold Nicholas Mackie, Raleigh
The American Institute of Architects Certificate of Merit: Kerry Alan Kane, Raleigh; Susan Monserud Christie, Raleigh
Alpha Rho Chi Medal: Wendy Carol Morrison, Durham

North Carolina Chapter of The American Institute of Architects Book Award: Philip Goodwin Freelon, Reston, Virginia

The American Society of Landscape Architects Certificate of Honor: Susan Prescott Little, Greensboro

The American Society of Landscape Architects Certificate of Merit: William Camp Lincicome, Parkersburg, West Virginia

North Carolina Chapter of The American Society of Landscape Architects Book Award: Jean Elizabeth Vissering, Amherst, Massachusetts

The Industrial Designers Society of America Student Award: Yasuhiko Taguchi, Yokosuka-Shi, Japan

The Appalachian Hardwood Manufacturers, Inc., Book Award: Leslie Dianne Mitchell (Product Design), Lexington; Mark Bradly Templeton (Product Design), Melville, New York; Douglas Philip Brotherton (Visual Design), Charlotte

Walter Hook Book Award: Withheld

SCHOOL OF EDUCATION

Agricultural Education Awards: most outstanding seniors – David Richard Gooden, Elizabethtown, Fall, 1974; Raymond Neil Caviness, Siler City, Spring, 1975.

Vocational Industrial Clubs of America Collegiate Leadership Award: Timothy Glen Bevacqua, Raleigh

Education Council Outstanding Senior Awards: Industrial Arts Education – James Luther Jones, New Bern; Mathematics Education – Zandra Kim Sledge, Jamestown; Psychology – Joanne Medlock Ashe, Concord; Science Education – William Douglas Taylor, Durham; Technical Education – Franklin Frazier, Cary; Vocational Industrial Education – Bradley Jay McDonald, Raleigh.

Alpha Pi Chapter, Epsilon Pi Tau Leadership Award: James Luther Jones, New Bern

Alpha Kappa Chapter, Iota Lambda Sigma Outstanding Service Award: Daphne Jane Euliss, Liberty, undergraduate; Gordon Fearing Copeland, Elizabeth City, graduate.

Student Recognition Award, Department of Industrial and Technical Education: Sherry Ruth Nye, Elizabethtown

SCHOOL OF ENGINEERING

Dean's Special Merit Award: James R. Jones, Raleigh (Senior, Mechanical Engineering)

Dean's Leadership Award: Steven A. Berry, Hickory (Senior, Nuclear Engineering)

The Humanitarian Award: Jacob M. Rudisill, Charlotte (Senior, Mechanical Engineering)

The Outstanding Engineering Senior Award: Francis P. O'Dell, Matthews (Senior, Chemical Engineering)

The Outstanding Engineering Citizen Award: James Reid Rowlett, Potomac, Maryland (Senior, Electrical Engineering)

Biological and Agricultural Engineering:

American Society of Agricultural Engineers, Senior Honor Award: Donnie Ray Ellis, Garner

Chemical Engineering:

Eastern North Carolina Section AICHE Outstanding Senior Award: Francis Phillip O'Dell, Matthews

Civil Engineering:

Associated General Contractors Award to Outstanding Senior in Civil Engineer-

ing: James Albert Thompson, Raleigh

North Carolina Chapter of American Public Works Association Award to Outstanding Seniors in Civil Engineering: Henry Van Liles, Jr., Morganton; Dennis Jerome Blackwell, Laurinburg

American Society of Civil Engineers Outstanding Seniors Awards: Don Michael Bailey, Lexington; David Dwight Gray, Hamptonville; Brian Howard Jasperse, Thomasville

American Society of Civil Engineers The Outstanding Senior Award: Tom Brian Langley, Virginia Beach, Virginia

Electrical Engineering:

Outstanding Senior Award: James Reid Rowlett, Potomac, Maryland

N. C. Association of Municipal Electric Systems Award: Henry Edwin Ernst, Concord; Don William Scarboro, Rocky Mount

Outstanding IEEE Student Award: Roger Lee Lineberry, Randleman

Engineering Science and Mechanics:

The Sixth COMMA-DOT-EYE Award to the Outstanding Senior in Engineering Science and Mechanics: Guey Chi Lu, Hong Kong

Engineering Operations:

Outstanding Senior Award: Patricia Claire Cohn, Charlotte

J. W. Joseph Award: David Gene Bagwell, Asheville

Furniture Manufacturing and Management:

Outstanding Senior Award: Wayne Powell Jones, Hickory

Industrial Engineering:

Outstanding Senior Award: Randy A. Walker, Raleigh

Materials Engineering:

Outstanding Senior Award: Richard E. Ricker, Newport News, Virginia

Mechanical and Aerospace Engineering:

American Society of Mechanical Engineers Certificate of Award for Outstanding Student Member: Jacob M. Rudisill, Charlotte

American Institute of Aeronautics and Astronautics Lecture Award: Francis E. Baker, Fountain Valley, California

American Institute of Aeronautics and Astronautics Outstanding Achievement Award: Thomas Clark Horne, Winnabow

Nuclear Engineering:

Outstanding Senior Award: Steven Andrew Berry, Hickory

SCHOOL OF FOREST RESOURCES

Xi Sigma Pi Senior Award: Rex Alexander Robertson, Windermere, Florida

Xi Sigma Pi Freshman Award: Robert R. Kaminskas, Linden, New Jersey

Biltmore Scholarship Awards: Bruce A. Bayle, Baltimore, Maryland; Gary K. Grubbs, Winston-Salem

Conger Scholarship Awards: Michael P. Pennington, Berlin, Maryland; Robert Houston Westmoreland, Lexington

Homelite Honors Awards: Steven Howard Baker, Pilot Mountain; Phoebe Ann Cutler, Newburgh, New York

Paper Industry Management Association Awards: (Southern Division) Glenn Harman, Lenoir; (Southeastern Division) Frank W. Metheney, Ballwin, Missouri

Slocum Scholarship Award: Phoebe Ann Cutler, Newburgh, New York

Weyerhaeuser Fellowship Awards: Jimmy D. Gregory, Snow Hill; Charles Richard Nelson, Titusville, New Jersey

Rho Phi Alpha Award: Joseph H. Kayler, Jr., Gastonia

SCHOOL OF LIBERAL ARTS

The Liberal Arts Highest Scholastic Achivement Award: Jean Elizabeth Aycock, Fayetteville
Outstanding Senior Award: Monte Corwin Towe, Converse, Indiana

SCHOOL OF PHYSICAL AND MATHEMATICAL SCIENCES

Awards for Mathematics:
Outstanding Senior in Mathematics (tie): Glenn Allen Evans, Youngsville; William Jennings Terrell, Charlotte
Outstanding Junior in Mathematics: Joseph Timothy Sizemore, Eden
Outstanding Sophomore in Mathematics: David Benton Pistole, Morehead City

Awards for Chemistry:
The Chemical Rubber Company Award for Outstanding Achievement in Freshman Chemistry: Kenneth Allen Harrison, New Bern
The Merck Index Award for Scholastic Achievement in Chemistry: William Lynwood McCullen, Rocky Mount
The North Carolina Institute of Chemists' Outstanding Student Award: Nancy Bizzell Fleming, Charlotte
The Undergraduate Award in Analytical Chemistry: Carolyn King Hart, Raleigh

SCHOOL OF TEXTILES

Harry Ball Honor Award: Nancy W. Webster, Mebane
Saul F. Dribben Memorial Award: Arnold Keith Price, Selma
Lawrence Iason Honor Award: Gary T. Starr, Lexington
Harry Riemer Honor Award: William Grover Godwin, Kenly
Chester H. Roth Honor Award: Elizabeth A. Humphries, Winston-Salem
John M. Reeves Scholarship: Pamela R. Coats, Garner (Junior)
Textile Veterans Association Honor Award: Michael E. Hamlin, Hendersonville
John E. Reeves Award: Marie R. Davis, Roxboro
Donald F. McCullough Award: Janice M. Artis, Four Oaks
American Association of Textile Chemists and Colorists Award: John W. Duncan, Jr., Charlotte
Phi Psi Textile Fraternity Award: Nicholas E. Irwin, Sparta
American Association for Textile Technology Award: John Arthur Redding, Jr., Lewisville
Sigma Tau Sigma Scholarship Fraternity Award: Charles P. Roberts, III, Shelby
Delta Kappa Phi Textile Fraternity Award: William Grover Godwin, Kenly
Henry A. Rutherford Honorary Award: Pamela R. Coats, Garner
The Dean's Award: Benton Everette Scarboro, Jr., Mt. Gilead

ALUMNI ATHLETIC AWARD

David O'Neal Thompson, Shelby

THE HONOR SOCIETY OF PHI KAPPA PHI

Awards for 1975:
Intellectual Achievement — Ph.D. Candidate: Neill Stephen Smith, Raleigh
Intellectual Achivement — Master's Candidate: Robert McMaster Butler, Raleigh
Highest Scholastic Achievement — Senior: Francis Phillip O'Dell, Matthews
Highest Scholastic Achievement — Junior: Bonnie Krista Livengood, Raleigh
Highest Scholastic Achievement — Sophomore: Mary John Baxley, Siler City

AIR FORCE ROTC AWARDS

American Legion ROTC Scholastic Award: James M. Tarlton, Marshville (Silver)

American Legion ROTC Military Excellence Award: William T. Garner, Rockingham (Gold); Thomas A. Curran, Winston-Salem (Silver)

Daughters of the Founders and Patriots of America Award: David E. Barbee, Winston-Salem

Reserve Officers Association: Scott C. Harrison, Lowell (Gold); Gardner C. Hodge, Jr., Raleigh (Silver); Steve R. Thompson, Staley (Bronze)

Military Order of World Wars Award: Houston H. Polson, Iron Station (Gold); Joseph D. Howard, Fayetteville (Silver); Don L. Lowdermilk, Nebo (Silver); James A. Trotter, Rocky Mount (Bronze)

National Sojourners Award: William M. Banks, Woodbridge, Virginia

General Dynamics AFROTC Award: Ralph L. Johnston, Jr., Fayetteville

Sons of the American Revolution Award: Margaret E. Lyle, Greensboro

American Defense Preparedness Association Award: Donnie R. Ellis, Clinton

AFROTC Superior Performance Ribbon: Thomas A. Curran, Winston-Salem; Margaret E. Lyle, Greensboro; Dale R. Williams, Mathews; Charles W. Wood, Burlington

AFROTC Outstanding Commander Ribbon: William E. Covington, III, Fayetteville; William T. Gardner, Rockingham; William A. Hewitt, Fayetteville; James M. Tarlton, Marshville

AFROTC Outstanding Staff Officer Ribbon: Roger T. Corbin, Asheville; Tim O. Henrickson, Kannapolis; Richard H. Shore, Winston-Salem; Dale R. Williams, Mathews

AFROTC Extracurricular Activities Leadership Ribbon: Gardner C. Hodge, Jr., Raleigh

AFROTC First Honors Ribbon: James M. Tarlton, Marshville (1 OLC)

AFROTC Second Honors Ribbon: David E. Barbee, Huntsville (1 OLC); David A. Brisson, Cary (3 OLC); Roger T. Corbin, Asheville; William E. Covington, III, Fayetteville (3 OLC); Hugh B. Edsall, Concord; Donnie R. Ellis, Clinton (1 OLC); Howard W. Frye, II, Carthage (4 OLC); William T. Gardner, Rockingham (1 OLC); Mary H. Gaul, Hobgood; Lee Glaser, Virginia Beach, Virginia (2 OLC); Scott C. Harrison, Lowell (2 OLC); Roby C. Hartley, Lenoir; Tim O. Henrickson, Kannapolis; Gardner C. Hodge, Jr., Raleigh; Thomas C. Horne, Winnabow; Joseph D. Howard, Fayetteville; Ralph L. Johnston, Jr., Fayetteville (2 OLC); Frank R. Litaker, Concord; Michael R. Lloyd, Raleigh (2 OLC); Don L. Lowdermilk, Nebo (2 OLC); Margaret E. Lyle, Greensboro; David R. Nichols, Fayetteville; Richard P. Nordan, Smithfield; Charles E. Meacham, Ellerbe (2 OLC); Alfred M. Priest, Gray Court, South Carolina; Timothy K. Roberts, High Point; Jackie W. Russell, Denton; John J. Seigner, Jr., Charlotte; Richard H. Shore, Winston-Salem; Frances W. Smith, Raleigh (1 OLC); Daniel H. Tillotson, Spartanburg, South Carolina; David C. Thomas, Fort Bragg (1 OLC); James A. Trotter, Rocky Mount; John R. Way, Jr., Fayetteville; Michael J. Weisenberger, Norwalk, Ohio; Dale A. Wolfe, Kings Mountain

AFROTC Distinctive GMC Cadet Ribbon: William E. Baker, Jr. Suffolk, Virginia; Mary H. Gaul, Hobgood; James M. Hunnicutt, III, Charlotte; Stephen G. Payne, Greensboro; Lewis S. Robinson, Winston-Salem; Daniel H. Tillotson, Spartanburg, South Carolina; Patricia A. Wallace, Winston-Salem; Dale A. Wolfe, Kings Mountain

AFROTC Extracurricular Activities Distinctive Participation Ribbon: Mary H. Gaul, Hobgood; Angela J. Grant, Wilson; Kathy L. Martin, Franklin; Charles E. Meacham, Ellerbe; Jackie W. Russell, Denton; John J. Siegner, Jr., Charlotte; Sharon L. Weers, Raleigh

Professor of Aerospace Studies Award: Timothy K. Roberts, High Point

Commandant of Cadets Award: Houston H. Polson, Iron Station

Flight Instruction Program Award: Scott C. Harrison, Lowell

Community Service Award: Thomas C. Horne, Winnabow

ARMY ROTC AWARDS

American Legion Medals for Military Excellence: Emmett D. Kemp, Raleigh; John D. Culp, Charlotte

American Legion Medals for Scholastic Excellence: Shuji S. Corey, Williamston; Warren L. Whitlock, Oxford

Armed Forces Communication and Electronic Association Award: Edward M. Siomacco, Fayetteville

American Defense Preparedness Association Award: Stuart A. Glover, Raleigh

Association of the United States Army Award: Medal and Certificate, Daniel K. Chandler, Cary; Book for Military History, Robert C. Hood, Newport News, Virginia

Department of the Army Superior Cadet Decoration Award: David R. Smith, Albemarle; Michael H. Kennedy, Fayetteville; James G. Boatner, Fort Polk, Louisiana; Richard T. Byrne, Houghton Lake, Michigan

Reserve Officers Association Award: Bruce T. Brown, Raleigh; Michael J. Clubb, Mobile, Alabama; Benjamin P. Dean, Jacksonville

Military Order of World Wars Award: John C. Simpson, Fayetteville; William C. Kirkland, Fayetteville; Mary C. Dupere, Fayetteville

Distinguished Military Student Award: Richard M. O'Neil, Roanoke Rapids

American Veterans of World Wars Award: Richard M. O'Neil, Roanoke Rapids

Braxton Bragg Chapter AUSA Award: Edward M. Cowan, Winston-Salem

National Sojourners Award: Edward F. Womble, Rich Square

Sons of the American Revolution Award: Talbot Locklear, Shannon

Daughters of the American Revolution Medal: Emmett D. Kemp, Raleigh

Veterans of Foreign Wars Medal: Mike W. Hoadley, Fayetteville

Daughters of Founders and Patriots of America Medal: Larry Williams, Elizabeth City

Colonel John W. Harrelson Award: Joseph L. Walden, Raleigh

Military Proficiency Award: Bruce T. Brown, Raleigh; Robert E. Mercer, Morehead City; Edward M. Siomacco, Fayetteville

P. T. Award: Walter C. Cummings, Fayetteville; Emmett D. Kemp, Raleigh

Recondo Badge: Bruce T. Brown, Raleigh; Edward M. Cowan, Winston-Salem; Walter C. Cummings, Fayetteville; Stuart A. Glover, Raleigh; Jack W. Hauser, Raleigh; Emmett D. Kemp, Raleigh; William C. Kirkland, Fayetteville; Warren P. Jones, Wake Forest; Robert E. Mercer, Morehead City; Donald L. Prasse, Pineville; Edward M. Siomacco, Fayetteville; Steven H. Vaden, Charlotte

Flight Program: Angus S. Aull, Raleigh; Terry W. Shockley, Cary; Edward M. Siomacco, Fayetteville

Parachutist Badge: John C. Adams, Wilkesboro; Bruce T. Brown, Raleigh; Daniel K. Chandler, Cary; Stuart A. Glover, Raleigh; Jack W. Hauser, Raleigh; Emmett D. Kemp, Raleigh; Jerry R. Miller, Lexington; Luis G. Morales, Spring Lake; Donald L. Prasse, Pineville; John C. Simpson, Fayetteville; David R. Smith, Albemarle

Distinguished Military Student: Bruce T. Brown, Raleigh; Walter C. Cummings, Fayetteville; Stuart A. Glover Raleigh; Jack W. Hauser, Raleigh; Emmett D. Kemp, Raleigh; Robert E. Mercer, Morehead City; Richard M. O'Neil, Roanoke Rapids; Donald R. Prasse, Pineville; Edward M. Siamacco, Fayetteville; David R. Smith, Albemarle

Ranger: David R. Smith, Albemarle

USAF ROTC Cadets Commissioned 1974-1975

TO BE COMMISSIONED ON 17 MAY 1975

*Harrison, Scott Carpenter ..... Lowell
*Polson, Houston Hardin ..... Iron Station
*Roberts, Timothy Kenneth ..... High Point
*Russell, Jackie Wade ..... Denton
Adams, Robert Lee ..... Murphy
Brisson, David Arthur ..... Cary
Corbin, Roger Taylor ..... Asheville
Covington, William Edward, III ..... Fayetteville
Ellis, Donnie Ray ..... Clinton
Gardner, William Thomas, Jr. ..... Rockingham
Glaser, Lee ..... Virginia Beach, Virginia
Hayes, Bernard Maurice ..... Fayetteville
Henrickson, Tim O'Keefe ..... Kannapolis
Horne, Thomas Clark ..... Winnabow
Nichols, David Roy ..... Fayetteville
Shore, Richard Henry ..... Lewisville

COMMISSIONED ON 15 APRIL 1975

Booth, Aucey Gray, Jr. ..... Rocky Mount

COMMISSIONED ON 3 JULY 1974

Cegal, Mark Anthony ..... West Suffield, Connecticut

COMMISSIONED ON 2 AUGUST 1974

Ivey, Patrick Lee ..... Raleigh

COMMISSIONED ON 16 AUGUST 1974

Fox, Larry Wayne ..... Pleasant Garden

COMMISSIONED ON 20 DECEMBER 1974

O'Connell, Mary Louise ..... Raleigh
Peeler, Irving Ray ..... Salisbury

Army ROTC Cadets Commissioned 1974-1975

TO BE COMMISSIONED ON 17 MAY 1975

Almond, Robert L. ..... Johnson City, Tennessee
*Brown, Bruce T. ..... Raleigh

---

* Distinguished Military Graduate

Corey, Shuji S. ..... Williamston
Davis, Michael R. ..... Shelby
*Glover, Stuart A. ..... Wilson
*Hauser, Jack W. ..... Raleigh
Holt, Henry V. ..... Butner
Jones, Warren P. ..... Wake Forest
*Kemp, Emmett D. ..... Raleigh
*Lea, John A. ..... Raleigh
*Mercer, Robert E. ..... Morehead City
*Prasse, Donald L. ..... Pineville
*Siomacco, Edward M. ..... Fayetteville
Terrill, Andrew S. ..... Southern Pines

TO BE COMMISSIONED JULY AND AUGUST 1975

Aull, Angus S. ..... Raleigh
*Jordan, Michael W. ..... Thurmont, Maryland
*O'Neil, Richard M. ..... Roanoke Rapids
Shockley, Terry W. ..... Cary
Speer, Larry S. ..... Raleigh
Starnes, William J. ..... Raleigh

COMMISSIONED DECEMBER 1974

*Duke, Frederick S. ..... Wilmington
Langston, Needham W. ..... Durham

* Distinguished Military Graduate

NORTH CAROLINA

Agricultural Institute

FOURTEENTH COMMENCEMENT

University Student Center
North Carolina State University
May 16, 1975

F O U R T E E N T H

A G R I C U L T U R A L I N S T I T U T E

G R A D U A T I O N

May 16, 1975
2:00 p.m.

PROCESSIONAL

INVOCATION . . . . . Neal McGlamery
Methodist Chaplain to Students
North Carolina State University

ADDRESS . . . . . Harry Gatton
Executive Vice President
North Carolina Bankers Association
Raleigh, North Carolina

AWARDING OF DIPLOMAS . . . . . J. E. Legates, Dean
E. W. Glazener, Director of Academic Affairs
H. B. Craig, Associate Director of Academic Affairs
School of Agriculture and Life Sciences

REMARKS . . . . . John Tyler Caldwell
Chancellor
North Carolina State University

RECOGNITION OF MARSHALS . . . . . J. E. Legates, Dean

BENEDICTION . . . . . Neal McGlamery
Methodist Chaplain to Students

RECESSIONAL

* * * * * *

Reception immediately following the graduation ceremony

AGRICULTURAL INSTITUTE GRADUATES

May 16, 1975

AGRICULTURAL EQUIPMENT TECHNOLOGY

David Mark Gillis
Monty Earl Lockamy
Andrew Reid O'Brian
Charles Danny Ogburn

AGRICULTURAL PEST CONTROL

Joseph Ronald Adams
John Taylor Gurkin
Raymond Joseph Meyers, Jr.

FIELD CROPS TECHNOLOGY

Claude Preston Banks, II
Tony Ralph Bonds
James Michael Doxey
George Allen Harden
David Thomas Herring
Eddie Nelson Jones
James Neil Maxwell, Jr.
Timothy Wilson Roberson
Charles Alan Robinson
Marvin Chapple Stephenson, Jr.
Francis Jefferson Stocks
Callie Morris Williford, Jr.

FLOWER AND NURSERY CROPS TECHNOLOGY

✓Milton Alderman Bland
Dennis Dale Cover
Samuel Parker Haddock
Carmen Rosemary Lanz
Jeff Allan Maddocks
Doyle Allison Stout, Jr.

GENERAL AGRICULTURE

* # Thomas Antony Chason
William Blake Jackson, III
✓Frank Worthy McDonald
Gary William McLaughlin
Michael Isaac Moore
John Hall Morrison

LIVESTOCK MANAGEMENT AND TECHNOLOGY

Charles Michael Best
Carl McGuire Cahoon, Jr.
Joseph Julian Chandler
George Marshall Copland
William Peyton Crawley, Jr.
* # Debra Evans Cress
James Kemp Davis
Richard Harwell Davis
Michael Edward Denning
Donald Wayne Denny
Douglas Edmund Hardee
* Robert Hughes Hudgins, Jr.
** Gordon Rouse Ivey
Donald Casper Jackson
* Cecil Jones, Jr.
Phillip Lynn Jones
Douglas William Lee
* Timothy Paul Lewis
* Chancey Gordon McIntyre, Jr.
Clinton Eric McPherson
Robert Michael Perry
Brandon Eugene Slate
Edward Dewitt Sumner
John Arthur Talton
* # Donald Fred Tornow, Jr.
Philemon Harris Walters
* Charles Patrick Warmack
# ✓Alan Howard Williams

SOIL TECHNOLOGY

** William Danny Cline
# ✓Raymond Rudolph Cranford, Jr.
James David Surber
✓John Crandall Wilson

TURFGRASS MANAGEMENT

** Paul Dean Baker
** ✓Wilson Fleetwood Britt, Jr.
* Frank John Gross, Jr.
Charles Ryon Harper
Rodney Quesnel Harris
** Phillip Andrew Heymann
* David Allen Hicks
Keith Alexander Hilliard
Jimmy Anthony Humphries
✓Steven Laufman Kirchgessner
* Banks Stanley Ozment
Thomas Stephen Sheets
* William Franklin Simonson
James Luther Warner, Jr.
William Edwards Warner
Carl Gregg Webb

DOUBLE MAJORS

✓Terry Shelton Bass
** # Willis Arthur Connell
# Needham Thomas Gulley
Allie Lee Newberry, Jr.

**High Honors *Honors

✓In Absentia #Graduated December, 1974

MARSHALS

Priscilla Swindell Searcy

Dovelle Outlaw, Jr.

John Randall Humphrey

Mark Keyzer

Clifford Wayne Loflin

William Robert Fitts

UNIVERSITY DIRECTORY

North Carolina State University

1975

UNIVERSITY DIRECTORY 1974-75

University Exchange 755-2011
Emergency Numbers

Fire Call Raleigh Fire Department 829-1911
Then call Security 3206, 3207

Emergency at night, Saturdays, Sundays or holidays—
Security 3206, 3207

Medical Aid—Call Infirmary 2564
or Rex Hospital 828-6211

Accidents involving radioactive materials—
Call ..... 2894 or 2895
Nights, Saturdays, Sundays or holidays ..... 787-2947 or 787-8637

Physical Plant (during working hours)—
To report malfunctions and breakdowns
Control Center 2991

INTERCAMPUS CALLS—TELPAK SYSTEM

Calls to the following exchanges may be made on official business without charge from Centrex telephones.

Chapel Hill telephones—Dial "8" plus the seven-digit number.
Charlotte telephones—Dial "5" plus the seven-digit number.
Durham telephones—Dial "4" plus the seven-digit number.
Greensboro campus telephones—Dial "7" plus the four-digit number.
Other Greensboro telephones—Dial "79" plus the seven-digit number.

ABOUT THE COVER

Tribute to Alumni

The alumni and the Alumni Association of North Carolina State University make a big difference to the institution. They support it in the important arena of public affairs where decisions on issues can be of critical importance and they support the University with voluntary financial contributions that have an impact far beyond their dollar measure. Support of Alumni Distinguished Professors, annual Outstanding Teacher Awards, the Library, student activities and other programs are but a few of the important ways in which alumni and the association contribute to the vigor and quality of the University. State now has 47,002 degree alumni, not counting the thousands who have attended the institution since its founding but did not earn degrees (and they also qualify by definition at all institutions of higher education as alumni). What is truly startling about NCSU degree alumni is that *more than half* of them have earned their degrees since 1962! State had awarded 22,949 degrees through the commencement of 1962. Since then the University has awarded 24,153 degrees.

This directory is published in limited numbers by North Carolina State University for use by University personnel and is not for public distribution.

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CENTREX TELEPHONE INSTRUCTIONS

If after reading the following instructions, you require further assistance, please dial "0" for campus operator. Also dial "0" to report a telephone which is not operating properly.

INCOMING CALLS

Direct local outside calls to campus numbers may be made by dialing 737 plus the four-digit extension number. When the number is not known, callers will receive assistance by dialing the university exchange, 737-2011.

LOCAL CALLS

To other Centrex telephones—Dial the four-digit number listed in this directory.

To Raleigh telephones—Dial "9" plus the seven-digit number listed in the Raleigh Telephone Directory.

LONG DISTANCE CALLS

Long distance calls will be billed to your CENTREX telephone number.

To make a direct station-to-station call, dial "9," then "1," the area code and the seven-digit number.

To make a long distance call with the assistance of the telephone company operator, dial "9" then "0," the area code and the seven-digit number.

TO TRANSFER CALLS

Remain on the line, depress the receiver plunger once for one second and release. Give the CENTREX attendant your transfer request.

DIRECTORY AND INFORMATION CHANGES

Advise the chief operator (dial "0") immediately of all personnel changes affecting CENTREX telephone numbers so that the listings will always be current.

TELEPHONE EQUIPMENT CHANGES

The following procedure will be used for approval of orders for additions or changes in telephone equipment.

1. To secure technical information prior to submitting a request, department heads may contact the Telephone Company Business Office.
2. The department head will then prepare a letter in duplicate to the Office of Business Affairs, Attention: Mrs. Olive Stone, 112 Winston, setting forth the specific changes or additions in equipment which are desired. This letter must designate the availability and source of funds to pay for the service requested.
3. The Supervisor of Telephone Services will process the order with the Telephone Company and the Physical Plant office, after it has been determined that funds, in fact, are available to support the request.

The Office of Business Affairs insists that the budget adjustments necessary to support additional telephone service be submitted and approved in writing prior to initiation of the service order to the Telephone Company.

GENERAL ADMINISTRATION

THE UNIVERSITY OF NORTH CAROLINA

	Chapel Hill
Central Telephone	**933-6981**
President	William Friday
Vice-president—Academic Affairs	Raymond H. Dawson
Vice-president—Finance	L. Felix Joyner
Vice-president—Planning	John Sanders
Associate Vice-president—Research and Public Service Programs	E. Walton Jones
Director, Educational Television	George E. Bair
Secretary of the University	John P. Kennedy, Jr.
Assistant to the President	James L. Jenkins
Assistant to the President	Arnold K. King
Assistant to the President	Richard H. Robinson, Jr.

North Carolina State University

Chancellor	John T. Caldwell	A Holladay	2191, 2192
Provost and Vice Chancellor	Nash N. Winstead	109 Holladay	2195
Acting Vice Provost and Dean of the Graduate School	R. James Peeler, Jr.	104 Peele	2871
Vice Provost and Dean for Research	Earl G. Droessler	208 Daniels	2117
Vice Chancellor for Extension and Public Service	W. L. Turner	138 1911 Bldg.	2144, 2145
Dean for International Programs	Jackson A. Rigney	209 Daniels	3201, 829-2380
Vice Chancellor for Student Affairs	Banks C. Talley, Jr.	101 Holladay	2446, 2447
Vice Chancellor for Finance and Business	John D. Wright	105 Holladay	2155
Vice Chancellor for Foundations and Development	Rudolph Pate	12 Holladay	2846

Deans of the Schools

Agriculture and Life Sciences	J. E. Legates	112 Patterson	2668
Design	Claude E. McKinney	200-B Brooks	2201
Education	Carl J. Dolce	208-C Poe	2231, 2232
Engineering	Ralph E. Fadum	229 Riddick	2311, 2312
Forest Resources	Eric L. Ellwood	2028-H Biltmore	2883, 2884
Liberal Arts	Robert O. Tilman	119-A Tompkins	2467, 2806
Physical and Mathematical Sciences	Arthur C. Menius, Jr.	115 Cox	2501, 2502
Textiles	David W. Chaney	101 Nelson	3231

SCHOOLS, DEPARTMENTS, DIVISIONS AND OFFICES

A

Office	Head	Address	Phone
Administrative Computing Services			
Manager	H. Leo Buckmaster	B-8-A Nelson	2794
Admissions			
Director	Anna P. Keller	112 Peele	2431
Asst. Dir.	George R. Dixon	112 Peele	2437
Asst. Dir.	Ann M. Smallwood	116 Peele	2437
Asst. Dir.	Larry S. Guess	112 Peele	2437
Adult and Community College Education			
Head	E. J. Boone	111 Ricks	2707
Adult Learning Laboratory			
Coordinator	Anne Burt	420 Poe	3163
Agricultural Education			
Acting Head	T. R. Miller	510-L Poe	2234
Agricultural Experiment Station	J. C. Williamson, Jr.	100-D Patterson	2717
Agricultural Information			
Head	W. L. Carpenter	118 Ricks	2800, 2804
Agricultural Institute			
Director	H. Bradford Craig	107 Patterson	3248
Agriculture and Life Sciences, School of			
Dean	J. E. Legates	112 Patterson	2668
Admn. Officer	R. W. Gay, Jr.	120 Patterson	2716
Academic Affairs			
Assoc. Dean & Dir.	E. W. Glazener	115 Patterson	2614, 2615
Assoc. Dir.	H. Bradford Craig	107 Patterson	3248
Asst. Dir.	J. L. Apple	100 Patterson	2665
Placement	A. A. Masella	111 Patterson	3249
Agricultural Extension Service			
Assoc. Dean & Dir.	George Hyatt, Jr.	104 Ricks	2811, 2812
Assoc. Dir.	T. C. Blalock	106 Ricks	2811, 2812
Asst. Dir., County Operations	J. E. Foil	108 Ricks	2813
Asst. Dir., 4-H Youth	C. D. Black	201 Ricks	2801, 2802, 2803
Asst. Dir., Home Econ.	Eloise Cofer	101 Ricks	2781, 2782
Asst. Dir., Marketing	G. L. Capel	107 Ricks	3252
Asst. Dir., Training	E. J. Boone	109 Ricks	2707
Research (Experiment Station)			
Assoc. Dean & Dir.	J. C. Williamson, Jr.	100-D Patterson	2717
Asst. Dir.	Eric L. Ellwood	2028-H Biltmore	2883, 2884
Asst. Dir.	George J. Kriz	100-C Patterson	2719
Asst. Dir., Bio. Sciences	J. L. Apple	100-A Patterson	2665
Asst. Dir., Tobacco	K. R. Keller	100-B Patterson	2718
Research Stations	P. H. Kelley	N. C. Dept. of Agri.	829-3236
Agromeck			
Editor	Jim Davis	3123 Univ. Stud. Cen.	2409
Air Force ROTC	Col. D. F. First	145 Coliseum	2417
Alumni Affairs			
Director	Bryce R. Younts	Alumni Bldg.	2869
Asst. Dir.	Robert G. Shipley, Jr.	Alumni Bldg.	2869
Editor	Doug Unwin	Alumni Bldg.	2869
Animal Science			
Head	I. D. Porterfield	123 Polk	2755, 2756

Office	Head	Address	Phone
Artificial Insemination Lab		4730 Hillsborough St.	2688
Dairy Herd Improvement Assn.		203 Polk	2771
Dairy Records Proc. Cen.		Leazar	2632
Ext. Animal Husbandry	A. V. Allen	117 Polk	2761, 2762
Ext. Dairy Husbandry	M. E. Senger	102 Polk	2771, 2772
Ext. Swine Husbandry	D. G. Spruill	201 Polk	2566
Randleigh Farm		Rt. 2, Raleigh	772-6711
Reproductive Physiology Research Lab		1400 Blue Ridge Blvd.	2673
Architecture Program		200 Brooks	2204, 2202
Archives	Maurice S. Toler	G-111 Library	2273
Army ROTC	Col. Robert E. Lenzner	154 Coliseum	2428
Athletics			
Director	Willis R. Casey	Case Ath. Center	2101
Asst. Dir.	J. Frank Weedon	Case Ath. Center	2560, 2101
Sports Information Dir.	Ed Seaman	Case Ath. Center	2102
Baseball	Sam Esposito	Case Ath. Center	2104
Basketball	Norman L. Sloan	Case Ath. Center	2105
Fencing	Larry Minor	Case Ath. Center	2101
Football	Lou L. Holtz	Case Ath. Center	2114
Golf	Richard Sykes	Wendell, N.C.	365-7337
Lacrosse	Charles Patch	Carmichael Gym	2486
Soccer	Max Rhodes	Carmichael Gym	2486
Swimming	Don Easterling	Case Ath. Center	2101
Tennis	J. W. Isenhour	Carmichael Gym	2486
Track	James B. Wescott	Case Ath. Center	2101
Wolfpack Club Dir.	Warren Carroll	Case Ath. Center	2112
Wrestling	Bob Guzzo	Case Ath. Center	2104
Auditor (Internal)	James A. Weathers, Jr.	207-A Holladay	2110, 2148

B

Biochemistry			
Head	Gennard Matrone	126 Polk	2581
Biological and Agricultural Engineering			
Head	F. J. Hassler	100 Weaver	2694, 2695, 2696
Ext. Bio. & Agri. Engr.	Frank J. Humenik	200 Weaver	2675
Biological Sciences			
Asst. Dir., Acad. Affairs & Research	J. L. Apple	100-A Patterson	2665
Biological Sciences Interdepartmental			
Teaching Program Coordinator	C. F. Lytle	1543 Gardner	3341
Biomathematics (See Statistics)			
Book Store General Manager	Mark H. Wheless	SSS Bldg.	2161
Book Depts. Supv.	Thomas V. Setzer	SSS Bldg.	3117
Asst. Gen. Manager	Robert Armstrong	SSS Bldg.	2161
Buildings Supt.	G. Graham Glass	SSS Bldg.	2161
Botany			
Head	G. R. Noggle	2214 Gardner	2724, 2727
Herbarium		3207 Gardner	2700
Budgets and Accounting			
Director	G. L. Worsley	103 Holladay	2143
Asst. Dir.	C. B. Nelson	105 Holladay	2175
Buildings Superintendent	George F. Lynch	4 Park Shops	2181
Business Affairs, Office of Vice Chancellor for Finance			

Office	Head	Address	Phone
and Business	John D. Wright	105 Holladay	2155
Asst. Vice Chancellor For Finance	G. L. Worsley	103 Holladay	2143
Business Services Officer	Ernest E. Durham	203 Holladay	2146
Payroll Office	R. W. Dittmar	206 Holladay	2151
Student Accounts	W. R. Styons	B Holladay	2986

C

Career Planning and Placement Center			
Director	Raymond E. Tew	122 Daniels	2396
Carter Stadium		Carter Stadium	2215, 2218
Cashier	Jerry LaGarde	B Holladay	2988
Central Stores			
Sales Dept. (Stock Information)		Central Stores	2230
Manager	J. L. Barbour	Central Stores	2198
Dept. Acct.	Barbara Byrd	Central Stores	2197
Freight Acct.	Emil Glarum	Central Stores	2211
Chancellor's Office			
Chancellor	John T. Caldwell	A Holladay	2191, 2192
Asst. to the Chancellor	William H. Simpson	A Holladay	2200
Asst. to the Chancellor	Helen O. Mann	A Holladay	2191, 2192
Chemical Engineering			
Head	J. K. Ferrell	113 Riddick	2324
Chemistry			
Head	Carl L. Bumgardner	108-A Dabney	2548
Glass Shop	Charles L. Stone	17 Dabney	2240
Supply Room	Curtis G. Harris	314, 328 Dabney	2547
Civil Engineering			
Head	Donald L. Dean	208 Mann	2331
Coliseum, Reynolds			
Director	Willis R. Casey	Case Ath. Center	2101
Box Office Mgr.	William R. Smaltz	105 Coliseum	2106
Concessions Supv.	Wiley L. Gouge	119 Coliseum	2123
Computer Science			
Head	Donald C. Martin	44 Dabney	2859, 2516
Undergrad. Admn.	Thomas L. Honeycutt	44 Dabney	2859, 2516
Grad. Admn.	Woodrow E. Robbins	28 Dabney	2859, 2516
Computing Center			
Director	Leroy B. Martin, Jr.	B-8-A Nelson	2517
Computing Services			2518
Dispatching Information			2523
Computing Center, Triangle Universities (TUCC)		(See Triangle Universities Computation Center)	
Computing Facility, Educ.	Georgia Rose	424 Poe	3149
Continuing Education, Division of			
Acting Director	R. A. Mabry	131 1911 Bldg.	2144, 2145
Assoc. Dir.	David B. Stansel	118 1911 Bldg.	2261
Curricular Activities Dir.	Charles F. Kolb	136 1911 Bldg.	2265
Short Courses and Conferences			
Asst. Dir.	M. Eugene Starnes	130 1911 Bldg.	2261
Cont. Educ. Spec.	Ned B. Broyles	123 1911 Bldg.	2261
Cont. Educ. Spec.	Kelly R. Crump	121 1911 Bldg.	2261
Cont. Educ. Spec.	Denis S. Jackson	124 1911 Bldg.	2261
Contracts and Grants Officer	Glenn Musser	10 Holladay	2153, 2154

Office	Head	Address	Phone
Cooperating Raleigh Colleges			
Director	M. Austin Connors, Jr.	Johnson Hall Meredith College	833-6461
Cooperative Engineering (See Engineering, Coop Program)			
Coop Sports Fishery Research			
Leader	M. T. Huish	4105 Gardner	2631
Counseling			
Director	Robert K. White	210 Peele	2423
Assoc. Dir.	G. F. Needham, Jr.	210 Peele	2423
Assoc. Dir.	W. D. Weston, Jr.	210 Peele	2423
Craft Center	Conrad W. Weiser	Thompson Bldg.	2457
Creamery	James I. Middleton	12 Schaub	2760
Crop Improvement Association			
Director	Foil W. McLaughlin	193 Williams	2851
Crop Science			
Acting Head	Philip A. Miller	256 Williams	2647, 2648
Teaching Coord.	D. A. Emery	284 Williams	2648, 2647
Grad. and Undergrad. Programs			
In Charge, Ext. Agronomy	G. L. Jones	252 Williams	2653
Curriculum Materials Center	Inez Ray	400 Poe	3191
Curriculum and Instruction Program, Education			
Coordinator	Barbara M. Parramore	402-C Poe	3221, 3222

D

Dairy (See Animal Science and Food Science)			
Design Library	Helen Zschau	209 Brooks	2207
Design Program, Basic			
Director	Duncan R. Stuart	321 Brooks	2205
Design, School of			
Dean	Claude E. McKinney	200-B Brooks	2201, 2202
Design Shop	James L. Bost	117 Brooks	2204
Division of Education			
Coordinator	Barbara M. Parramore	402 Poe	3231, 3222
Dormitories (See Residence Halls)			
Duplicating Facility, Education	Ann Matthews	742 Poe	3287

E

Ecology Program			
Co-chairman	D. E. Davis	2123 Gardner	2741
Co-chairman	G. R. Noggle	2214 Gardner	2727
Economics			
Head	W. D. Toussaint	201-B Patterson	3273
Asst. Head	B. M. Olsen	201-F Patterson	3273
Asst. to Head and Scheduling Officer	H. T. Daniel	201-E Patterson	3273
Ext. Economics	F. D. Sobering	212 Patterson	3107
Education Administration and Supervision			
Program Coordinator	Carl J. Dolce	208 Poe	2231
Education, School of			
Dean	Carl J. Dolce	208-C Poe	2231, 2232
Assoc. Dean	William Maxwell, Jr.	208-B Poe	2231, 2232
Electrical Engineering			
Head	Larry K. Monteith	Mail: 232 Daniels Office: 234 Daniels	2336

Office	Head	Address	Phone
Assoc. Head, Grad. Study	W. D. Stevenson, Jr.	236 Daniels	2339
Asst. Head, Undergrad. Programs	W. P. Seagraves	235 Daniels	2338
Electron Microscope Facility	K. E. Muse	1221 Gardner	2664
Employment Office	William R. Calloway	Primrose	2135
Employment Office (Student part-time work) Counselor	Mary Usry	205 Peele	2421
Engineering, Coop Program Director	J. V. Hamme	236 Riddick	2300
Engineering Science and Mechanics Head	Patrick H. McDonald	118 Riddick	2341, 2254
Engineering Operations Curriculum Director	W. T. Easter	235 Riddick	2458
Engineering Research Director	Robert F. Stoops	2153 Burlington	2345
Asst. Dir.	Billy M. Gay	2158 Burlington	2346
Engineering, School of Dean	Ralph E. Fadum	229 Riddick	2311, 2312
Assoc. Dean, Acad. Affairs	R. G. Carson	232 Riddick	2316
Assoc. Dean, Res. & Programs	Henry B. Smith	224 Riddick	3328, 3329
Assoc. Dean for Extension	John R. Canada	241 Riddick	3262
Freshman Engr. & Stud. Serv. Div.	Robert H. Hammond	238 Riddick	3263
English Head	Larry S. Champion	114-C Winston	2462
Asst. Head, Dir. of Undergrad. Programs	R. B. White, Jr.	106-B Winston	2466
Acting Dir., Div. of Speech	R. B. White, Jr.	122 Tompkins	3204
Dir. Freshman Program	N. G. Smith	104 Winston	2416
Dir., Grad. Program	J. D. Durant	107 Winston	2416
Entomology Head	Kenneth L. Knight	2301 Gardner	2746
Ext. Entomology	G. T. Weekman	2309 Gardner	2703, 2831
Extension Dean (See University Extension)			

F

Facilities Planning Division Director	Edwin F. Harris, Jr.	Basement, Watauga	2121
Faculty Club Manager	Harry E. Anderson	4200 Hillsborough St.	828-0308
Faculty, Dean of (See Provost)			
Faculty Senate Chairman	James B. Wilson	2319 Library	2279
Fiber and Polymer Science Program	D. W. Chaney	101 Nelson	3221
Financial Aid Office Director	Carl O. Eycke	205 Peele	2421, 2448
Asst. Dir.	Paul D. West, Jr.	205 Peele	2421, 2448
Counselor	Florence I. Francis	205 Peele	2421, 2448
Counselor	Mary F. Usry	205 Peele	2421, 2448
Food Science Head	W. M. Roberts	100-C Schaub	2951
Ext. Food Science	W. M. Roberts	100-C Schaub	2951

Office	Head	Address	Phone
Dairy Plant	J. I. Middleton	12 Schaub	2760
Food Services			
SSS Snackbars	Russell T. Uzzle	SSS Bldg.	2164
Univ. Stud. Center	Lawrence S. Gilman	Univ. Stud. Cen.	2498
Foreign Student Advisor	Philip F. Weaver	213 Peele	2423
Forest Resources Library	Samuel A. Clark	4012 Biltmore	2306
Forest Resources, School of			
Dean	Eric L. Ellwood	2028-H Biltmore	2883, 2884
Asst. Dean	LeRoy C. Saylor	2028-C Biltmore	2883
Extension	Walter M. Keller	3036-D Biltmore	3386, 3387
Forestry			
Head	Charles B. Davey	2018-E Biltmore	2892
Foundation Seed Producers, Inc.			
Manager	R. W. McMillen	124 Williams	2821
Foundations and Development			
Vice Chancellor	Rudolph Pate	12 Holladay	2846
Asst. Dir. of Found.	C. W. Hart	12 Holladay	2846
Asst. in Found.	Ray Smith	12 Holladay	2846
Asst. Dir. of Found.	R. N. Wood	12 Holladay	2846
Fraternities			
Interfraternity Council			
President	Wayne Lowder	4130 Univ. Stud. Cen.	2404
Alpha Gamma Rho		2304 Hillsborough St.	833-1203
Alpha Phi Alpha		P. O. Box 5483	639-4895
Delta Sigma Phi		1526 Tryon Rd.	772-8854
Farmhouse		115 Park Ave.	832-0886
Kappa Alpha		2601 W. Frat. Ct.	755-9185
Kappa Sigma		2613 W. Frat. Ct.	832-3812
Lambda Chi Alpha		108 S. Frat Ct.	832-5364
Phi Kappa Tau		2511 W. Frat. Ct.	828-7625
Pi Kappa Alpha		214 S. Frat. Ct.	828-7641
Pi Kappa Phi		2401 W. Frat. Ct.	755-9996
Sigma Alpha Epsilon		2701 W. Frat. Ct.	834-6904
Sigma Alpha Mu		2501 W. Frat. Ct.	828-8153
Sigma Chi		2409 W. Frat. Ct.	833-7811
Sigma Nu		204 S. Frat. Ct.	832-1172
Sigma Phi Epsilon		100 S. Frat. Ct.	832-4118
Sigma Pi		2513 Clark Ave.	833-5116
Tau Kappa Epsilon		2619 W. Frat. Ct.	833-6926
Theta Chi		20 Maiden Ln.	834-3585
Freight & Express Dept.,			
Central Stores	Emil Glarum	Central Stores	2211
Friends of the College	Margaret Marks	Univ. Stud. Cen.	2452
Furniture Manufacturing & Management			
In Charge	Anco L. Prak	341 Riddick	3335, 3338
Furniture Research & Development Applications Institute			
Acting Director	Anco L. Prak	343 Riddick	3338, 3335

G

Genetics			
Acting Head	Dale R. Matzinger	3513 Gardner	2291
Nursery		Reedy Creek Rd.	2757
Geosciences			
Head	Carlton J. Leith	216 Withers	2212, 2213
Graduate School			

Office	Head	Address	Phone
Acting Vice Provost and Dean	R. James Peeler	104 Peele	2871, 2872, 2873
Grounds Superintendent	Michael D. McGough	18 Riddick Stad.	2181
Guidance and Personnel Services Head	W. E. Hopke	520-L Poe	2244

H

Health Services (Student) Information		Clark Inf.	2564
Director	Carolyn S. Jessup	200 Clark Inf.	2563
Highway Research Program Coordinator	W. Grigg Mullen	309 Mann	2353
History Head	Bernard W. Wishy	161 Harrelson	3383
Home Economics Extension	Eloise Cofer	101 Ricks	2781, 2782
Aging	K. Isabelle Buckley	218 Ricks	2770
Clothing	Dorothy Barrier	206 Ricks	2783
Family Relations	L. F. Hawkins	207 Ricks	2793
Food and Nutrition	Marjorie Donnelly	213 Ricks	2786, 2787
Home Management	Thelma Hinson	207 Ricks	2784
Housing-House Furnishings	W. C. Warrick	212 Ricks	3208, 3209
Horticultural Science Head	James W. Strobel	120 Kilgore	3131
Ext. Horticulture	A. A. Banadyga	160 Kilgore	3321

I

Industrial and Technical Education Head	D. M. Hanson	502-L Poe	2241
Industrial Arts Education Program Coordinator	Talmage B. Young	300 Poe	2236, 2237
Industrial Engineering Head	William A. Smith, Jr.	328 Riddick	2363
Industrial Extension Service Assoc. Dean for Extension	John R. Canada	241 Riddick	3262
Ext. Education Mgr.	John R. Hart	133 Daniels	2356
Field Services Mgr.	Daniel E. Harrell	242 Daniels	2358
Infirmary (See Health Service)			
Information Center	Corinne S. Philbrick	Univ. Stud. Cen.	3138
Information Services Director	Hardy D. Berry	Watauga	2874
Asst. Dir. (Publications)	Joseph S. Hancock	Watauga	2874
Asst. Dir. (News)	Graham E. Jones	Watauga	2874
Information, Visitor Parking & Traffic		Traffic Booth	3205
Institute of Statistics Director	D. D. Mason	110 Cox	2528
International Programs Dean	Jackson A. Rigney	209 Daniels	3201, 829-2380

J

Journal, NCSU	Patty N. Shelley	Watauga	3371

L

Office	Head	Address	Phone
Landscape Architecture Program			
Director	Richard R. Wilkinson	310-C Brooks	2203, 2205
Laundry and Dry Cleaning			
Manager	Joseph R. Gower	Laundry	2122
Liberal Arts, School of			
Dean	Robert O. Tilman	119-A Tompkins	2467, 2806
Assoc. Dean	William B. Toole, III	116 Tompkins	2468, 2806
Dir., Coop. Educ.	Charles A. Parker	115-C Tompkins	3247
Library, D. H. Hill			
Dir. of Libraries	I. T. Littleton	1208 Library	2843, 2595
Asst. Dir. for General Services	Donald S. Keener	1206 Library	2843, 2595
Asst. Dir. for Reference Services	William C. Lowe	1130 Library	2830, 2935
Asst. Dir. for Collection Development	Cyrus B. King	1137 Library	2841
Acquisitions	Nellie L. Waltner	1124-B Library	3187
Binding	Joanna Boyette	G-116 Library	2842
Catalog	Lillie D. Caster	1126 Library	2598
Circulation	Melba E. Franklin	1212 Library	3364, 3365
Design Library	Helen K. Zschau	209 Brooks	2207
Documents	Mary E. Poole	2108 Library	3280
Forest Resources Library	Samuel A. Clark	4012 Biltmore	2306
General Serv. Librarian	Linda K. Osterman	1209 Library	3365, 3364
Interlibrary Center	Ann S. Smith	1133 Library	2116
Periodicals Serv. Cen.	Donna Toone	G-114 Library	3136
Photocopy	Lou Massengill	1222 Library	2596
Reference	W. Robert Pollard	1131 Library	2935
Reserve Room	Frieda Stamper	1121 Library	2597
Serials	Gloria W. Houser	G-112-114 Library	2842
Southern Water Resources Scientific Inf. Cen.	Jean Porter	2108 Library	2683
Technical Inf. Center	H. Ronald Simpson	1129 Library	2830
Textiles Library	James Baker	112 Nelson	3231

M

Machine Design (See Textile Machine Design)			
Marine & Coastal Studies, Center For			
Director	Jay Langfelder	1204 Burlington	3326
Marriage Counselor	Alice O. Pierce	203 Peele	2229
Materials Engineering			
Head	W. W. Austin	109 Page	2377
Mathematics			
Head	Nicholas J. Rose	252 Harrelson	2382
Mathematics and Science Education			
Head	H. E. Speece	326-S Poe	2239
Mechanical and Aerospace Engineering			
Head	Carl F. Zorowski	3211 Broughton	2365, 2366
Assoc. Head	James C. Williams, III	3229 Broughton	2365, 2366
Microbiology			
Head	J. B. Evans	4515-B Gardner	2391
Modern Languages			
Head	Alan A. Gonzalez	360 Harrelson	2475

Office	Head	Address	Phone
Motor Pool	J. Norvelle Crocker	8 Riddick Stad.	2179
Music			
Director	J. Perry Watson	203 Price Music Cen.	2981

N

Navy Enlisted Scientific Education Program (NESEP)			
Officer in Charge	Lt. R. S. Allen, USN	337 Daniels	2897
New Arts, Inc.	Lee McDonald	Univ. Stud. Cen.	2451
News Services (See Information Services)			
Nuclear Engineering			
Head	Thomas S. Elleman	1110-B Burlington	2301, 2302
Nuclear Program			
Operations	James R. Bohannon, Jr.	2116 Burlington	2322, 2849
Technical Services	Lloyd R. Zumwalt	2107 Burlington	2304
Nutrition Faculty			
Chairman	E. E. Jones	325 Polk	2773, 2774

O

Occupational Education			
Dean	Carl J. Dolce	208-C Poe	2231, 2232
Occupational Education, Center for			
Director	John K. Coster	602-M Poe	3127, 3128
Operations Research			
Chairman	Salah E. Elmaghraby	322-A Riddick	2350

P

Payroll Office	Robert W. Dittmar	206 Holladay	2151
Personnel Office			
Director	William R. Calloway	Primrose	2135, 2136, 2137
Asst. Dir.	Charles B. Lynam	Primrose	2135, 2136, 2137
Staff Recruitment Officer	John C. Brooks	Primrose	2135, 2136, 2137
Supv. of Records	Shelba H. Haddock	Primrose	2135, 2136, 2137
Pesticide Residue Research Laboratory			
Director	T. J. Sheets	3709 Hillsborough St.	3391
Philosophy and Religion			
Head	Robert S. Bryan	121 Harrelson	2477
Physical and Mathematical Sciences, School of			
Dean	Arthur C. Menius, Jr.	115 Cox	2501, 2502
Research	Jasper D. Memory	116 Cox	2502, 2503
Physical Education and Intramural Athletics			
Head	Frederick R. Drews	201 Carmichael	3361
Intramural Sports Office	Jack Shannon	210 Carmichael	3161
Physical Plant Division			
Control Center	Esther M. Lutrick	125 Morris	2991
Director	J. McCree Smith	101 Morris	2181
Automotive Services			
Supt.	Spencer B. Glascock	8 Riddick Stad.	2181
Bldgs. Supt.	George F. Lynch	4 Park Shops	2181
Bus. Officer	John E. Higgins	202 Morris	2181
Campus Engineer	Carl D. Fulp	128 Morris	2181

Office	Head	Address	Phone
Contract Const. Supv.	Robert E. Fite	108 Morris	2181
Dept. Services Coord.	Stanford C. West	110 Morris	2181
Engr. & Utilities Supt.	J. A. Edwards	124 Morris	2181
Grounds Supt.	Michael D. McGough	18 Riddick Stad.	2181
Heating Plant	Harold S. Crumley	Heating Plant	2185
Housekeeping	H. C. Arnold	3 Park Shops	2188
Motor Pool	J. Norvelle Crocker	8 Riddick Stad.	2179
Physics			
Head	L. W. Seagondollar	106 Cox	2521, 2522
Physiology Faculty			
Chairman	I. S. Longmuir	135 Polk	2581
Phytotron (S. E. Plant Env. Lab)			
Director	R. J. Downs	2003 Gardner	2778
Placement (See Career Planning and Placement)			
Plant Pathology			
Head	Robert Aycock	2518 Gardner	2730
Ext. Plant Pathology	H. E. Duncan	1410 Gardner	2711, 2712
Police — Campus		Security Desk Field House	3206, 3207
Politics			
Head	William J. Block	201-A Tompkins	2481, 2504
Poultry Science			
Head	R. E. Cook	120 Scott	2626
Ext. Poultry Science	W. C. Mills	208 Scott	2621
Product Design Program			
Director	Vincent M. Foote	310-A Brooks	2205, 2203
Provost and Vice Chancellor's Office			
Provost and Vice Chancellor	Nash N. Winstead	109 Holladay	2195
Asst. Provost	Lawrence M. Clark	208 Holladay	3148
Asst. Provost	Murray S. Downs	201 Holladay	2194
Asst. to the Provost	William H. Simpson	A Holladay	2200
Coordinator, Institutional Studies and Planning	Marvin H. Gehle	202 Holladay	3125
Asst. Provost for Univ. Computing	Leroy B. Martin, Jr.	B-8-A Nelson	2517
Psychology			
Head	Howard G. Miller	640-D Poe	2251
Publications			
(Student)	Catharine Mintz Ruth Gruber	3134 Univ. Stud. Cen.	2413
Publications Office, Educ.	Ann Matthews	742 Poe	3287
Pulp and Paper Science and Technology			
In charge	R. G. Hitchings	2106 Robertson	2888
Purchasing Agent	W. L. Fleming	107 1911 Bldg.	2171
Asst. Purchasing Agent	A. H. Adams	100 1911 Bldg.	2171
Asst. Purchasing Agent	R. W. Knoll	100 1911 Bldg.	2171
Asst. Purchasing Agent	Sue A. Long	106 1911 Bldg.	2171
Asst. Purchasing Agent	F. D. Tilley	106 1911 Bldg.	2171

R

Radiation Protection Council			
Chairman	Ernest Hodgson	4620 Gardner	2274
Radiological Safety Officer	L. T. Caruthers	214 Clark Lab	2895
Radio Station			
WKNC-FM	Michael Gray	3122 Univ. Stud. Cen.	2400
Recreation Resources Administration			

Office	Head	Address	Phone
Head	T. I. Hines	4008-C Biltmore	3276
Registration and Records			
Registrar	James H. Bundy	4 Peele	2572
Asst. Registrar	R. A. Robinson	4 Peele	2572
Asst. Registrar	Pat J. Smith	7-A Peele	2576
Asst. Registrar	Paul V. Tuttle	7-A Peele	2576
Readmissions		11 Peele	2576
Student Records & Permanent Files		7-A Peele	2576
Transcripts		12-B Peele	2576
Veteran's Affairs Coord.	Eli D. Panee, Jr.	4-A Peele	2572
Religious Affairs			
Coordinator	O. B. Wooldridge, Jr.	Univ. Stud. Cen.	2414
University Chaplains			
Baptist	Ted Purcell	Baptist Stud. Cen.	834-1875
Catholic	Father Alan Dash	Univ. Stud. Cen.	2414
Episcopal	William S. Wells	Univ. Stud. Cen.	2414
Jewish	Rabbi Leo Stillpass	610 Hillsborough	833-9356
Lutheran	Stephen Gerhard	2723 Clark Ave.	828-1687
Methodist	Neal McGlamery	2501 Clark Ave.	833-1861
Presbyterian	Steve Shoemaker	27 Horne St.	834-5184
Research			
Vice Provost and Dean	Earl G. Droessler	208 Daniels	2117
Asst. Dean	Rolin F. Barrett	208 Daniels	2117
Residence Facilities			
Director	Roger W. Fisher	203 Peele	2407
Residence Halls			
Inter-Residence Council		4130 Univ. Stud. Cen.	3241
Alexander			
Head Residence Counselor		Thomas Knott	2906
Bagwell, Becton, Berry			
Area Coordinator		Candace Corvey	2915
Bowen Hall			
Area Coordinator		Roxanne Gallant	2927
Bragaw Hall			
Head Residence Counselor		Adnan Akay	2913
Carroll Hall			
Head Residence Counselor		Donna Ferguson	2920
Gold Hall			
Residence Adviser		Glen Ware	2916
Lee Hall			
Area Coordinator		Diane Dailey	2911
Head Residence Counselor		Ervin Poteat	2914
Metcalf Hall			
Head Residence Counselor		Duty Greene	2928
Owen Hall			
Head Residence Counselor		Kerry Kane	2909
Sullivan Hall			
Area Coordinator		Ronald Swain	2919
Head Residence Counselor		W. Don Bell	2910
Syme Hall			
Head Residence Counselor		Robert Wilson	2902
Tucker Hall			
Head Residence Counselor		John Viehe	2904
Turlington Hall			
Head Residence Counselor		Samual W. Glass	2918
Welch Hall			
Head Residence Counselor		Penny L. Sekadlo	2917

Office	Head	Address	Phone
Residence Life			
Director	Paul B. Marion	Leazar	2449, 2440
Admin. Asst. & Area Coordinator	M. Lee Salter	Bragaw Hall	2912
Housing Officer	James S. Fulghum, Jr.	Leazar	2449
Area Coordinator	Candace Corvey	Berry Hall	2915
Area Coordinator	Duty D. Greene	Metcalf	2928
Area Coordinator	Diane Dailey	Lee Hall	2911
Area Coordinator	Ronald Swain	Sullivan Hall	2919
ROTC (See Air Force and Army)			

S

Safety and Security	W. L. Williams	101 Field House	2157
Sea Grant Program, UNC			
Director	B. J. Copeland	1235 Burlington	2454, 2455
Asst. Dir.	William L. Rickards	1235 Burlington	2454, 2455
Security Office	W. T. Blackwood	103-A Field House	3206
Selective Service (See Veteran's Affairs Coord.)			
Sociology and Anthropology			
Head	Selz C. Mayo	341 1911 Bldg.	3180
Ext. Community Dev.	John N. Collins	238 1911 Bldg.	2670
Soil Science			
Head	C. B. McCants	222 Williams	2655, 2656
Ext. Soil Science	G. L. Jones	252 Williams	2653
AID—Soil Testing	J. W. Fitts	101 Williams	2277
Sororities			
Panhellenic Council President	Sheila Barnes	901-A Lee	834-8470
Alpha Delta Pi President	Cindy Cribb	902-E Carroll	834-4306
Sigma Kappa President	Sandy Dougher	610-A Lee	828-0878
Southeastern Plant Environment Laboratories (See Phytotron)			
Southern Engineer	Bob Marx	400-B Daniels	3124
Special Education Program Coordinator	Kathleen McCutchen	402 Poe	3221
Speech Acting Director	R. B. White, Jr.	121 Tompkins	3204
Speech Communication Audio Production Center	John Malcolm	3 King	3303
State Sentinel Editor	Ray Collins	108 King	3194
Statistics			
Head	D. D. Mason	110 Cox	2528
Biomathematics Prog. Dir.	H. L. Lucas	513-F Cox	2271
Student Address Information (See Univ. Stud. Cen.)			
Student Affairs, Division of			
Vice Chancellor	Banks C. Talley, Jr.	101 Holladay	2446, 2447
Assoc. Dean	Henry Bowers	Univ. Stud. Cen.	2452
Assoc. Dean	Gerald G. Hawkins	215 Alumni Bldg.	3151
Assoc. Dean	Kenneth D. Raab	202 Peele	2220
Assoc. Dean	Lyle B. Rogers	203 Peele	2229
Asst. to the Dean of Student Affairs for Planning and Research	Thomas H. Stafford, Jr.	215 Alumni Bldg.	2426
Student Development			

Office	Head	Address	Phone
Dean	John A. Poole	204 Peele	2441
Asst. Dean	Donald H. Solomon	204 Peele	2441
Adv. to Frats.	Jeff Mann	204 Peele	2442
Student Government			
President	Ron Jessup	4130 Univ. Stud. Cen.	2797
Senate Pres.	Larry Tilley	4130 Univ. Stud. Cen.	2797
Treasurer	David Guth	4130 Univ. Stud. Cen.	2797
Attorney General	Bob Taylor	4130 Univ. Stud. Cen.	2797
Student Publications (See Publications)			
Student Records and Permanent Files		7-A Peele	2576
Student Supply Store			
General Manager	Mark H. Wheless	SSS Bldg.	2161
Asst. Gen. Mgr.	G. Robert Armstrong	SSS Bldg.	2161
Book Depts. Supv.	Thomas V. Setzer	SSS Bldg.	3117
Snackbar Operations Supv.	Russel T. Uzzle	SSS Bldg.	2164
Vending-Concessions	Wiley L. Gouge	SSS Bldg.	2123, 2161
SSS Bldgs.	G. Graham Glass	SSS Bldg.	2161
Summer Sessions			
Director	Charles F. Kolb	136 1911 Bldg.	2265

T

Technical Information Center	M. Ronald Simpson	1129 Library	2839, 2830
Technician			
Editor	Bob Estes	3120 Univ. Stud. Cen.	2411
Telephone Services			
Supervisor	Olive B. Stone	112 Winston	2141
Operator	Bessie B. Turner	112 Winston	"0"
Television Center, WUNC-TV			
Director	Jack Porter	211-A Television Cen.	2853
Textile Chemistry			
Head	Henry A. Rutherford	115 Clark Lab.	2551
Textile Machine Design and Development	Paul D. Emerson	B-22 Nelson	3231
Textile Technology			
Head	J. F. Bogdan	107 Nelson	3231
Textiles Extension			
Director	D. S. Hamby	102 Nelson	3231
Textiles Library	James G. Baker	112 Nelson	3231
Textiles, School of			
Dean	David W. Chaney	101 Nelson	3231
Academic Coordinator	M. L. Robinson	126 Nelson	3231
Asst. Dean for Research	M. R. Shaw	108 Nelson	3231
Asst. to the Dean for Student Serv. & Asst. Placement Dir.	W. E. Smith	120 Nelson	3231
Theatres			
Stewart	Maggie Klekas	Univ. Stud. Cen.	3105
Thompson	Charles A. Martin, Jr.	Thompson Bldg.	2405
Tobacco Literature Serv.	Carmen Marin	2314 Library	2836, 2837
Toxicology Program			
Chairman	F. E. Guthrie	1523 Gardner	2276
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*York, Emory K., Agri. Res. Tech. I, Soil Sci. 408 Williams; Rt. 1, 112 Evelyn Dr., Knightdale	2645	266-3774
*Yorke, Carolyn H., Secr., Mod. Lang. 360 Harrelson; 2619 Crestline Ave., 27603	2475	772-3815
*Yoshikawa, Dr. Fumio, Res. Assoc., Crop Sci. Weed Sci. Cen., Ligon Rd., 27607; 3146-B Avent Ferry Rd., 27606	2867	851-3748
*Young, Clemon H., Night Supv., Bragaw Snackbar Stud. Supply Stores; 508 Sunnybrook Rd., 27610	2125	834-4523
*Young, Dr. David A., Prof., Ent. 4322 Gardner; 612 Buck Jones Rd., 27606	2833	
*Young, George J., Res. Tech. III, Biochem. 343-B Polk; 1104 Imperial Rd., Cary, 27511	2581	467-7198
*Young, J. B., Agri. Res. Tech., Plant Path. 2610 Gardner; P. O. Box 43, Holly Springs, 27540	2735	552-6143
*Young, Dr. James H., Assoc. Prof., Bio. & Agri. Engr. 127 Weaver; 4104 Pepperton Dr.	3101	851-5099
*Young, Dr. James N., Prof., Soc. 328 1911 Bldg.; 4211 Windsor Pl., 27609	2701	787-3360
Young, James W., Asst. Engr., Television Television Cen.; 3116 Campbell Rd., 27606	2853	851-0824
*Young, Malpheus F., Res. Tech., USDA, Crop Sci. 112 Williams; 3200 Campbell Rd., 27606	2734, 2704	851-0919
*Young, Milton B., Agri. Res. Tech., Poultry Sci. Res. Unit 6, Varsity Dr. Farm; 3110 Campbell Rd., 27604	2729	851-0934
*Young, Shirley E., Typist II, Econ. 3114 Library; H-16 McKimmon Village, 27607	2472	833-6733
*Young, Dr. Talmage B., Assoc. Prof. & Coord., Ind. Arts Sect. 300-R Poe; 5249 Vann St.	2236, 2237	851-3961
*Young, Tammie M., Visiting Instr., Div. of Educ. 408-A Poe	3221, 3222	
*Young, Dr. Robert V., Asst. Prof., English 214 Winston; 2008 Philcrest Rd., 27608	2465	787-4527
*Younts, Bryce R., Dir., Alumni Affairs Alumni Bldg.; 3712 Eakley Ct., 27606	2869	851-0235

Z

Zehr, Margaret C., Visiting Lecturer, Design 1133 Craborchard Dr., Apt. 1-D	2203	851-3831
*Zeiger, Dr. Donald C., Assoc. Prof., Hort. Sci. Mountain Hort. Crops Res. Sta., Rt. 2, Fletcher, 28732; 623 Lennox Pl., Hendersonville, 28739	(704) 684-7197	(704) 692-1288
*Zia, Dr. Paul Z., Prof. & Assoc. Head, Civil Engr. 210 Mann; 2227 Wheeler Rd., 27607	2352	787-6583
*Zimmerman, Clementine F., Res. Tech., Plant Path. 3405 Gardner; 439 Glenbrook Dr., 27610	2751	833-0515
*Zimmermann, Paul A., Visiting Instr., Ind. Engr. 331-D Riddick; 2320 Champion Ct., 27606	3335, 3338	833-7840
*Zobel, Dr. Bruce J., Prof., Forestry 1013-A Biltmore; Penny Rd., 27606	2891	851-3156
*Zorowski, Dr. Carl F., R. J. Reynolds Co. Prof. & Head, Mech. & Aero. Engr. 3211 Broughton; 4513 Pitt St., 27609	2366, 2365	787-0937
*Zschau, Helen K., Librarian, Design Library 209 Brooks; 2125 Woodland Ave.	2207	829-0139
Zumwalt, Dr. Lloyd R., Prof., Nuclear Engr. 2107 Burlington; 100 Horne St., Apt. 1, 27607	2304	834-3195

* Married
† Widowed

UNIVERSITY COMMITTEES 1974-75

ADMISSIONS

Faculty:
Donald H. J. Steensen, *Chm.*
M. Keith DeArmond
Ralph W. Greenlaw
James A. Kilby
Julia G. McVay
Richard M. Myers, *Senate*
Mendel L. H. Robinson
Patricia L. Tobin
Harvey E. Wahls
Augustus M. Witherspoon

Ex Officio:
Admissions Office Rep. (Anna P. Keller)

Students:

ART ACQUISITIONS ADVISORY

Faculty:

Paul A. Bredenberg, *Chm.*
Elliott R. Barrick, *Senate*
Richard E. Chandler
Joseph H. Cox
Kerry S. Havner
Claude E. McKinney
George W. Poland
Student: (ex officio) Chm., Univ. Stud. Center Gallery Bd. ( )

ATHLETICS COUNCIL

	Term expires
Faculty:	
Robert S. Bryan, *Chm.*	1981
Robert J. Monroe	1975
Howard A. Petrea, *Senate*	1975
Vincent M. Foote	1976
Elizabeth M. Suval	1977
John F. Ely	1978
William H. Breezley	1979
Alumni:	
Dan C. Gunter, Jr.	1975
Thomas L. Watson, Jr.	1976
Ronald D. Shavlik	1977
Students:	
Timothy D. Cathey	1975
Irene Eugenia Jordan	1975
Michael Stanton Sutton	1976

CAMPUS STORES ADVISORY

Faculty or Staff:
Charles S. Levings, *Chm.*
Larry K. Monteith
Ronald W. Rousseau, *Senate*
Liaison/Bus. Aff. (Ernest E. Durham)

Students:

CAREER PLANNING AND PLACEMENT ADVISORY

Faculty:
Charles R. Manning, *Chm.*
Maurice G. Cook
William T. Easter, *Senate*
Joseph A. Porter, Jr.
Odell Uzzle
Ex officio: Dir., Career Plan. & Place. Center (R. E. Tew)

Students:

Industry representatives:
Wendell M. Patton (FCX)
Andrew G. Hinton, Jr. (State Govt. Personnel)
William L. Dunn, III (Cameron-Brown)
Peggy Elting (Square D)

COLISEUM ADVISORY

Faculty or Staff:
W. Curtis Fitzgerald, *Chm.*
J. G. Allgood
Henry Bowers
Willis R. Casey
Henry C. Cooke
Roy A. Larson, *Senate*
Michael D. McGough
Conrad H. Miller
Charles B. Nelson
Stanford C. West

Students:

COMMENCEMENT ADVISORY

Faculty:
Patrick H. McDonald, *Chm.*
Maurice H. Farrier
Perry L. Grady
Mary Paschal
Stanley Suval, *Senate*

(Continued next page)

Ex officio:
Assoc. Dean, Stud. Aff. (Kenneth D. Raab)

Students:

COMMITTEE ON COMMITTEES

(All members *ex officio*)
Provost Chm. (N. N. Winstead)
Asst. Provost (M. S. Downs)
Immed. past Chm., Fac. Senate ( )
Chm., Fac. Senate (J. B. Wilson)
Vice Chm., Faculty Senate (S. B. Tove)
Vice Chanc. for Stud. Aff. (B. C. Talley, Jr.)

COMPUTER AFFAIRS ADVISORY

Faculty or Staff:
Henry E. Schaffer, *Chm.*
Donald W. Barnes, Jr.
William D. Cooper, *Senate*
Donald W. Drewes
Robert J. Fornaro
A. Ronald Gallant
William C. Horner
J. C. Smith
Thomas H. Stafford, Jr.
Robert J. Weir
Bernard W. Wishy
Ex officio and non-voting:
Asst. Dir., Comp. Center (R. A. Usanis)
Asst. Provost for Univ. Comp. (LeRoy B. Martin, Jr.)
Asst. Vice Chanc. for Fin. & Bus. (G. L. Worsley)

COUNSELING CENTER ADVISORY

Faculty:
Grover C. Miller, *Chm.*
Nanette S. Henderson
Garland K. Hilliard
Clayton L. Stalnaker, *Senate*

Ex officio:
Dir. of Counseling (R. K. White)

Students:

COURSES AND CURRICULA

Faculty:
Peter R. Lord, *Chm.*

(Continued next column)

John A. Bailey, *Senate*
Roger H. Clark
Robert L. Hoffman
Victor A. Jones
John R. Kolb
Catherine E. Moore
Man M. Sawhney
Donald E. Smith
William E. Smith
George H. Wahl, Jr.
Charles W. Welby
Paul Z. Zia

Ex officio:
Asst. Provost (M. S. Downs)

EXTENSION AND CONTINUING EDUCATION

Faculty or Staff:
P. Paul Thompson, *Chm.*
Charles S. Cooper
Thomas I. Hines
W. K. Lynch
Charles A. Parker
William M. Roberts
Larry H. Royster
Henry Sanoff
Robert G. Savage
Thomas C. Shore
Charles Smallwood, *Senate*

Ex officio:
Vice Chanc. for Ext. & Public Serv. (W. L. Turner)

Students:

FACULTY HOSPITALITY AND ORIENTATION

Faculty or Staff:
Linda K. Osterman, *Chm.*
Louis E. Aull
Mary K. Head
Michael J. Magazine
James E. Pardue
Willis M. Parker
John P. Reuer
Sybil R. Ricks
Hans Sagan
Robert E. Sternloff
Oscar B. Wooldridge, *Senate*
Lyla Kloos (*rep. Woman's Club*)
Liaison/Chanc. Off. (W. H. Simpson)

O. MAX GARDNER AWARD

Faculty:
Raymond L. Murray, *Chm.*
Lawrence H. Bowen

(Continued next page)

Teddy T. Hebert
Solomon P. Hersh
Guy Owen
Vernon F. Shogren
Herbert E. Speece
Bruce J. Zobel

GOOD NEIGHBOR COUNCIL

Faculty or Staff:
Bhupender S. Gupta, *Chm.*
Paul J. Capps
Alois L. Chalmers
Sylvia C. Cole
Frank E. Emory
William S. Galler
Richard A. King
Linwood Manning
Charles G. Moreland
Gene Namkoong
Margaret E. Rogers
Mary C. Williams, *Senate*
Liaison/Raleigh Comm. Council (
)
Liaison/Chancellor (W. H. Simpson)
Liaison/Provost (L. M. Clark)
Ex officio: Dir. of Security (W. L. Williams

Students:

GOVERNMENT

Faculty:

	Term expires June 30
Keith S. Petersen, *Chm.*	1975
Henry C. Cooke	1975
Gerald H. Elkan	1975
John F. Ely	1976
Hassan A. Hassan	1976
Charles F. Murphy	1977

GRADUATE SCHOOL ADMINISTRATIVE BOARD

	Term expires
R. James Peeler, Jr., *Chm.*	
Richard A. Wilkinson	May 1975
Howard M. Nahikian	March 1975
William A. Jackson	July 1975
LeRoy C. Saylor	July 1975
Wesley O. Doggett	Sept. 1975
Durwin M. Hanson	Nov. 1975
Larry S. Champion	Feb. 1976
Solomon P. Hersh	Sept. 1976
Carl F. Zorowski	March 1977
Philip A. Miller	Nov. 1977
Thomas S. Elleman	Dec. 1977

GROUP INSURANCE AND WELFARE

Faculty or Staff:
David H. Timothy, *Chm.* (1977)
Maurice H. Clayton
Harry E. Duncan, *Senate*
Thomas F. Gordon
Dale M. Hoover
Helen S. Horne
Herman Lawing
John W. Lee
Ardell C. Linnerud
Daniel M. Peterson
John O. Rawlings
Elizabeth M. Suval
Richard E. Sylla
R. Craig Wilburn

Ex officio:
Payroll & Benefits Officer (R. W. Dittmar)
Rep., Provost's Off. (L. B. Martin, Jr.)

HARRELSON FUND

Faculty or Staff:
Cyrus B. King, *Chm.*
W. Randolph Carter
Dennis E. Garoutte
George Goldfinger
Yasuyuki Horie
James M. Leatherwood
Edith D. Sylla
Students:

HEARINGS COMMITTEES

Faculty Hearing
Mediation Panel
Enforcement of disruptions policy:
Board of Inquiry
Hearings Panel
Emergency Consultative Panel

INSTITUTIONAL HISTORY AND COMMEMORATION

Faculty:
Isaac T. Littleton, *Chm.*
William W. Austin
William L. Carpenter
J. Clyde Johnson
Stuart Noblin
Frederick G. Warren
Norman F. Williamson

Ex officio:
Dir., Inf. Serv. (H. D. Berry)

(Continued next page)

Vice Chanc., Fdns. & Dev. (R. Pate)
Univ. Archivist (M. S. Toler)
Rep., Stud. Aff. (J. P. Watson)
Dir., Alumni Aff. (B. R. Younts)
Pres., Stud. Govt. (R. L. Jessup)
Rep., Alpha Phi Omega ( )

Students:

INTERNATIONAL PROGRAMS COUNCIL

Faculty:

Mansour H. Mohamed, *Chm.*
Raul E. Alvarez
Burton F. Beers
Charles B. Davey
Charles W. Harper
Ronald G. Pearson, *Senate*
Joseph N. Sasser
Carl B. Turner

Ex officio:

Dean, Internat'l Prog. (J. A. Rigney)
Rep. of ALS Admn. (J. L. Apple)
Rep. of Engr. Admn. (R. G. Carson)
Vice Prov. and Dean, Grad. Sch. (R. J. Peeler)
Foreign Stud. Advisor (P. F. Weaver)

Students:

LABORATORY ANIMAL CARE AND FACILITIES

Faculty:

	Term expires June 30
Rolin F. Barrett	1975
James M. Leatherwood	1975
J. Lawrence Apple	1976
William M. Colwell	1976
Harold Keating	1976
Howard G. Miller	1977
J. Mal Whitsett	1977
Daniel J. Moncol, *Chm.*	1977

LIBRARY

Faculty:

Jack D. Durant, *Chm.*
Carl E. Bryan
Fred V. Cahill
Leon D. Freedman
William L. Gragg
Joe O. Lammi
Robert S. Metzger, *Senate*
Herbert H. Neunzig
Jay W. Randle
Frances M. Richardson
Alan L. Tharp

(Continued next column)

A. C. Triantaphyllou
John K. Whitfield

Ex officio:

Dir. of Libraries (I. T. Littleton)

Students:

PARKING AND TRAFFIC

Faculty or Staff:

Fred R. Tarver, *Chm.*
Willard F. Babcock
Dinus M. Briggs
Sylvia G. Gurkin
James E. Huneycutt, Jr., *Senate*
Michael D. McGough
Violet McIntosh
Beverly Saylor

Ex officio and non-voting:

Dir., Facilities Plan. (E. F. Harris)
Staff appointee, Stud. Aff. (D. H. Solomon)
Traffic Admn. Officer (W. L. Williams)
Dir., Phys. Plant (J. M. Smith)

Students:

PATENTS

Faculty or Staff:

Earl G. Droessler, *Chm.*
Rolin F. Barrett
Willard H. Bennett
David W. Chaney
Ernest E. Durham
Kenneth R. Keller
Robert F. Stoops

PLANNING AND ENVIRONMENT

Faculty or Staff:

John W. Duffield, *Chm.*
Arnold J Aho, *Senate*
Dalton R. Harrison
Robert L. Hoffman
Shun Kanda
Donald S. Keener
C. Paul Marsh
Hubert L. Owen
George G. Shaw
Charles Smallwood, Jr.
Frank J. Smith
M. Roger Warren

Ex officio:

Coord., Inst'l Studies & Plan. (M. H. Gehle)

(Continued next page)

Dir., Facilities Plan. (E. F. Harris)
Dir., Phys. Plant (J. M. Smith)

Students:

RADIATION PROTECTION COUNCIL

Faculty:

	Term expires Sept. 1
Ernest Hodgson, *Chm.*	1977
Lewis W. Seagondollar *Vice Chm.*	1977
Lawrence H. Bowen	1975
Alvin W. Jenkins, Jr., *Senate*	1975
David H. Martin	1975
Kuruvilla Verghese	1976
Alonzo F. Coots	1977
James A. Mulholland	1977
Elizabeth C. Theil	1978
William K. Walsh	1978

Ex officio:
Radiological Safety Officer: (L. T. Caruthers)
Liaison/Phys. Plant (C. D. Fulp)
Dir., Security (W. L. Williams)

REFUND OF FEES

Faculty or Staff:
Thomas P. Feeny, *Chm.*
Warren R. Henderson
William R. Leonhardt
Ex officio:
Dir., Stud. Accts. (W. R. Styons)

Students:

REGISTRATION, RECORDS, AND CALENDAR ADVISORY

Faculty:
A. J. Bartley, *Chm.*
John B. Easley
T. Waller George, *Senate*
Harold Keating
Wayland P. Seagraves
Robert S. Sowell

Ex officio:
Registrar (J. H. Bundy)
Rep., Cont. Educ. (C. F. Kolb)

Students:

RESEARCH

Faculty:
Irving S. Goldstein, *Chm.*

(Continued next column)

Peter Batchelor
John K. Coster
Paul D. Emerson
Robert M. Fearn
Frank E. Guthrie
David D. Mason
Hans H. Stadelmaier
Joseph A. Weybrew, *Senate*

Ex officio:
Vice Prov. & Dean for Res. (E. G. Droessler)
Contracts & Grants Officer (G. E. Musser)
Vice Prov. & Dean, Grad. Sch. (R. J. Peeler)
Asst. Dean, Text. Res. (M. R. Shaw)
Assoc. Dean, Engr. Res. (H. B. Smith)
Assoc. Dean, Lib. Arts (W. B. Toole, III)
Assoc. Dean, PAMS (J. D. Memory)
Dir. Res., ALS (J. C. Williamson)

RESIDENCE LIFE ADVISORY

Faculty:
Thomas L. Attaway, *Chm.*
J. M. Anthony Danby, *Senate*
Arthur P. Hansen
William Maxwell, Jr.
Virginia M. Prichard
William J. Vander Wall
Ex officio:
Dir., Residence Life (P. B. Marion)

Students:

SAFETY

Faculty or Staff:

Talmadge B. Young, *Chm.*	1976
Eugene P. Brantly, *Senate*	1975
Robert C. Gilmore	1975
Daniel E. Harrell	1975
George F. Lynch	1975
Harry Tucker, Jr.	1975
James R. Bohannon, Jr.	1976
William R. Calloway	1976
Richard D. Gilbert	1976
G. Graham Glass	1976
Eleanor H. Lammi	1976
H. Eldon Scott	1976

Ex officio and non-voting:
Radiological Safety Officer (L. T. Caruthers)
Dir, Univ. Safety Div. (C. L. Mann)
Dir., Security & Traffic (W. L. Williams)

Students:

SCHOLARSHIPS AND STUDENT AID

Faculty:

James R. Banker, *Chm.*
T. Joyce Caraway
Michael A. Littlejohn, *Senate*
Charles D. Livengood
J. Frank Seely
Charles G. Wright
Tommy E. Wynn

Ex officio:

Financial Aid Officer (C. O. Eycke)
Asst. Athletics Dir. (J. F. Weedon)

Students:

STUDENT HEALTH ADVISORY

Faculty or Staff:

Julian M. Fore, *Chm.*
Daniel M. Adams, Jr.
George T. Barthalmus
Frederick R. Drews
Frances W. Massey
George F. Needham

Ex officio:

Dir., Stud. Health Serv. (C. S. Jessup)

Students:

TEACHING EFFECTIVENESS AND EVALUATION

Faculty:

Harry C. West, *Chm.*
John F. Bogdan
Larry S. Champion
Forrest C. Hentz
Armstong Maltbie
LeRoy B. Martin, Jr.
John B. O'Neal, Jr.
Hubert V. Park

(Continued next column)

John F. Roberts
Duncan R. Stuart
Larry W. Watson, *Senate*

Ex officio:

Coord., Inst'l Stud. & Plan. (M. H. Gehle)

Students:

TELEVISION ADVISORY

Faculty:

Charles F. Lytle, *Chm.*
L. Raymond Camp
Max E. Gregory, *Senate*
William T. Huxster
Kathleen A. McCutchen
Lavon B. Page
Thomas L. Russell
Arthur T. Shankle
E. Wayne Taylor

Ex officio:

Dir., NCSU TV Center (Jack Porter)

Students:

USE OF HUMAN SUBJECTS IN RESEARCH

Faculty or Staff:

Ian S. Longmuir, *Chm.*
J. William Cunningham, *Senate*
Gary L. Faulkner
Wesley E. Kloos
William P. Marley
Donald H. Mershon
Nina M. Page
Nancy B. Rich
Donald H. Solomon
A. Donald VanDeVeer

Ex officio:

Asst. Dean for Res. (R. F. Barrett)
Liaison/Admn. (W. H. Simpson)

Students:

BUILDING LIAISON

PHYSICAL PLANT DIVISION

Building	Liaison
Agronomy Greenhouse & Headhouse	C. B. McCants
Alumni Building	
Alumni Affairs	Frances Thomas
Student Affairs	Gerald G. Hawkins
Athletic Areas (Outside)	Willis Casey
	Frank Weedon
Biltmore Hall	Robert C. Gilmore
Robertson Wing	R. C. Hitchings
Botany-Zoology Greenhouse & Hdhse.	J. Lawrence Apple
Brooks Hall	Winifred Hodge
Brooks Avenue House (110)	H. Leo Buckmaster
Broughton Hall (Including Diesel)	George O. Batton
Burlington Nuclear Laboratories	
Engineering Research	King R. Brose
Nuclear Engineering	F. J. Steinkruger
(Includes Marine Science and Sea Grant areas)	J. R. Bohannon (Alt.)
Carmichael Gymnasium	Margaret Rudy
Carter Stadium	Willis Casey
	Frank Weedon
Case Athletic Center	Willis Casey
	Frank Weedon
Central Stores	Joe L. Barbour
Chancellor's Residence	John T. Caldwell
David Clark Laboratories	
Textiles	Paul Emerson
	H. A. Rutherford (Alt.)
Radiation Safety	L. T. Caruthers
Clark Hall Infirmary	Doris C. Whitehouse
Cotton/Soybean Lab (Ligon Rd.)	C. A. Brim
Cox Hall	
Physics	Dwight Pendergraft
Statistics	Bill J. Stines
Dabney Hall	
Chemistry	Curtis G. Harris
Computer Science	James W. Hanson
Daniels Hall	
Electrical Engineering	E. G. Manning
Research Administration	Rolin F. Barrett
I .E. S.	J. R. Hart
	T. W. Stephenson (Alt.)
Physics	W. O. Doggett
Placement Center	Raymond Tew
Dearstyne Avian Research Center	R. E. Cook
	Larry Rozier (Alt.)
Erdahl-Cloyd	
Library	Donald Keener
Student Union Area	Henry Bowers
	Richard Heaton
	Lawrence S. Gilman
Field House	S. C. Schlitzkus
Fraternity Housing	Roger Fisher
Gardner Hall	J. L. Apple
Grinnells Animal Health Lab	
Animal Science	E. V. Caruolo
Veterinary Science	D. J. Moncol
Harrelson Hall	
Mathematics	H. V. Park
Liberal Arts	Carolyn Yorke

Building	Liaison
Statistics	Helen Ruffin
Harris Cafeteria	S. C. Schlitzkus
D. H. Hill Library	
Library	Donald S. Keener
Economics Areas	C. R. Pugh
Hodges Building	Robert C. Gilmore
Holladay Hall	Mary A. Wallace
Horticulture Greenhouse & Hdhses.	J. C. Taylor
Kent Road Greenhouse Complex	Kenneth R. Keller
Kilgore Hall	J. W. Strobel
King Building	Oscar Wooldridge
Laundry	Joe Gower
Leazar Hall	
Dairy Records	Glenn Wall
Housing Rental	J. S. Fulghum
School of Design	Winifred Hodge
Unassigned Areas	Sam Schlitzkus
Mann Hall	C. R. Bramer
McKimmon Village	Roger W. Fisher J. S. Fulghum
Morris Bulding	J. McCree Smith
Nelson Building	
Textiles	Paul Emerson
Computing Center	Bonnie G. Hine
1911 Building	
Continuing Education	David Stansel
Purchasing	W. L. Fleming
Agriculture	Katie Latham
Liberal Arts	Katie Latham
Nuclear Science Building (Bureau of Mines)	D. H. Martin
Page Hall	W. W. Austin
Park Shop Building	
Industrial Engineering	W. H. Burnette
Physical Plant	G. F. Lynch
Parking Deck	W. L. Williams
Patterson Hall	E. W. Glazener
Peele Hall	Kenneth D. Raab
Phytotron	R. J. Downs
Plant Pathology Greenhouse & Hdhse.	J. L. Apple
Poe Hall	William Maxwell, Jr.
Polk Hall	
Animal Science	J. M. Leatherwood
Biochemistry	J. A. Knopp
Poultry Lab	R. E. Cook Larry Rozier (Alt.)
Power Plant	J. A. Edwards
Price Music Center	Perry Watson
Primrose Hall	W. R. Calloway
Print Shop Building (Former)	John A. Poole
Student Affairs	
Radiation Areas	L. T. Caruthers
Residence Halls	Roger Fisher
Reynolds Coliseum	
Athletics	Willis Casey Bill Smaltz
ROTC	Richard F. McCoy
Ricks Hall	W. L. Carpenter
Riddick Lab	
Engineering (Includes Annex)	King R. Brose
Computing Center Area	Bev Saylor
Scott Hall	R. E. Cook Larry Rozier (Alt.)

Building	Liaison
Schaub Food Science Building	James Middleton Fred Warren (Alt.)
Student Supply Stores	
Central Student Supply Store	Graham Glass
Snack Bars	Russell Uzzle Graham Glass
Concession Areas (Coliseum, Carter Stadium, & Vending Machine Operations)	Wiley Gouge, Jr.
Frank Thompson	
Military Supply/Rifle Range	Richard McCoy
Craft Shop	Conrad Weiser
All Other Areas	John Andrews
Tompkins Hall	
Liberal Arts	Susan Babcock
Ag. Extension	W. L. Carpenter
Continuing Education	David Stansel
Design	Winifred Hodge
Education (Rms. 15-20)	William Maxwell, Jr.
TV Station	Jack Porter Dick Snavely
University Graphics Building	John Lee
University Student Center	Henry Bowers Richard Heaton Herbert Strickland Donald Solomon (Student Publications Area)
Varsity Drive Facility (Entomology Ext.)	G. B. Worley
Watauga Hall	
Facilities Planning	E. F. Harris, Jr.
Information Services	Hardy Berry
Weaver Laboratories	Robert G. Gaines
Williams Hall	
Crop Science	Paul H. Harvey
Soil Science	C. B. McCants
Winston Hall	Virginia Aldridge
Withers Hall	Carlton J. Leith
Weed Control Lab	A. D. Worsham Betty Phlegar (Alt.)

FACULTY SENATE MEMBERSHIP
1974-1975

Name	Term Ends	School	Address	Phone
Aho, A. J.	1975	Design	215-B Brooks	2203
Bailey, J. A.	1975	Engineering	4223 Broughton	2876
Barrick, E. R.	1975	Agr. & Life Sciences	220 Polk	2763
Brantly, E. P.	1976	Design	311-B Brooks	2205
Cooper, W. D.	1976	Textiles	204 Nelson	3231
Cunningham. J. W.	1976	Education	620 Poe	3127
Danby, J. M.	1976	PAMS	316 Harrelson	3210
Dobrogosz, W. J.	1976	Agr. & Life Sciences	4617 Gardner	2393
Duncan, H. E.	1976	Agr. & Life Sciences	1410 Gardner	2711
Easter, W. T.	1976	Engineering	235 Riddick	2458
George, T. W.	1975	Textiles	B-5-E Nelson	3231
Greenlaw, R.	1976	Liberal Arts	117 Harrelson	2484
Gregory, M. E.	1975	Agr. & Life Sciences	129-H Schaub	2956
Huneycutt, J. E., Jr.	1975	PAMS	224 Harrelson	3200
Jenkins, A. W., Jr.	1976	PAMS	408 Cox	2514
Larson, R. A.	1975	Agr. & Life Sciences	128 Kilgore	3132
Littlejohn, M. A.	1976	Engineering	232 Daniels	2330
Metzger, R. S.	1975	Liberal Arts	132 Harrelson	3214
Myers, R. M.	1976	Agr. & Life Sciences	225 Polk	2755
Pearson, R. G.	1976	Forest Resources	1022-K Biltmore	3181
Petrea H. A.	1975	PAMS	205 Harrelson	2381
Rogers, C. N.	1975	Forest Resources	2103 Robertson Wing, Biltmore	2888
Rousseau, R. W.	1975	Engineering	107 Riddick	2329
Sawhney, M. M.	1976	Liberal Arts	234 1911 Bldg.	2491
Smallwood, C.	1976	Engineering	416 Mann	2333
Stalnaker, C.	1976	Liberal Arts	150 Harrelson	2479
Suval, S.	1975	Liberal Arts	155 Harrelson	2485
Tove, S. B.	1975	Agr. & Life Sciences	342 Polk	2581
Watson, L. W.	1975	Education	326-H Poe	2238
Weybrew, J. A.	1975	Agr. & Life Sciences	407 Williams	3216
Williams, M. C.	1975	Liberal Arts	207 Winston	2463
Winstead, N. N.		Provost	109 Holladay	2595
Wooldridge, O. B.	1975	Education	1200 Univ. Student Center	2414

FACULTY SENATE OFFICE

Mrs. Linda W. Cox, Stenographer
2319 D. H. Hill Library (Erdahl-Cloyd Wing)
Phone: 2279

James B. Wilson, Chairman
234 Harrelson
Phone: 3350

FACULTY SENATE 1974-1975

J. B. Wilson, Chairman
S. B. Tove, Vice Chairman
R. G. Pearson, Secretary

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John A. Bailey
W. Douglas Cooper
J. Wm. Cunningham
J. M. Anthony Danby
Ralph Greenlaw
Robert S. Metzger
Richard M. Myers
Man M. Sawhney
Charles Smallwood

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Michael A. Littlejohn
Ronald G. Pearson
Man M. Sawhney
Clayton Stalnaker
Larry W. Watson
Joseph A. Weybrew

Constitution & Bylaws Committee

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John A. Bailey
J. Wm. Cunningham
Walter J. Dobrogosz
Stanley Suval
Joseph A. Weybrew
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Eugene P. Brantly
William T. Easter
Max E. Gregory
James E. Huneycutt, Jr.
Alvin W. Jenkins, Jr.
Richard M. Myers
Charles N. Rogers
Stanley Suval

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Arnold J. Aho
Roy A. Larson
Howard A. Petrea
Ronald G. Pearson
Ronald W. Rousseau
Samuel B. Tove
Mary C. Williams

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Harry E. Duncan
T. Waller George
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Max E. Gregory
Alvin W. Jenkins
Robert S. Metzger
Charles N. Rogers
Charles Smallwood
Larry W. Watson

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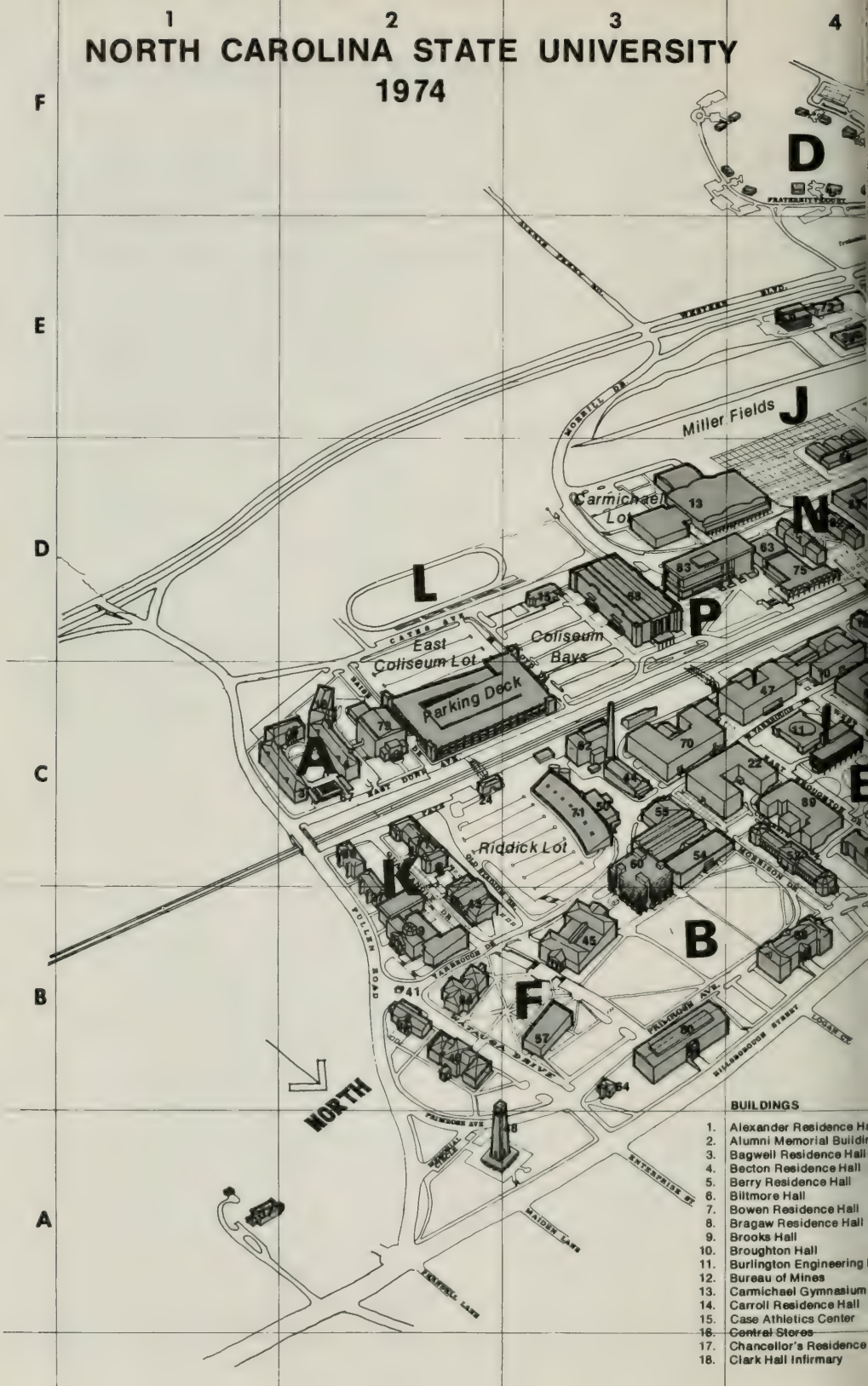
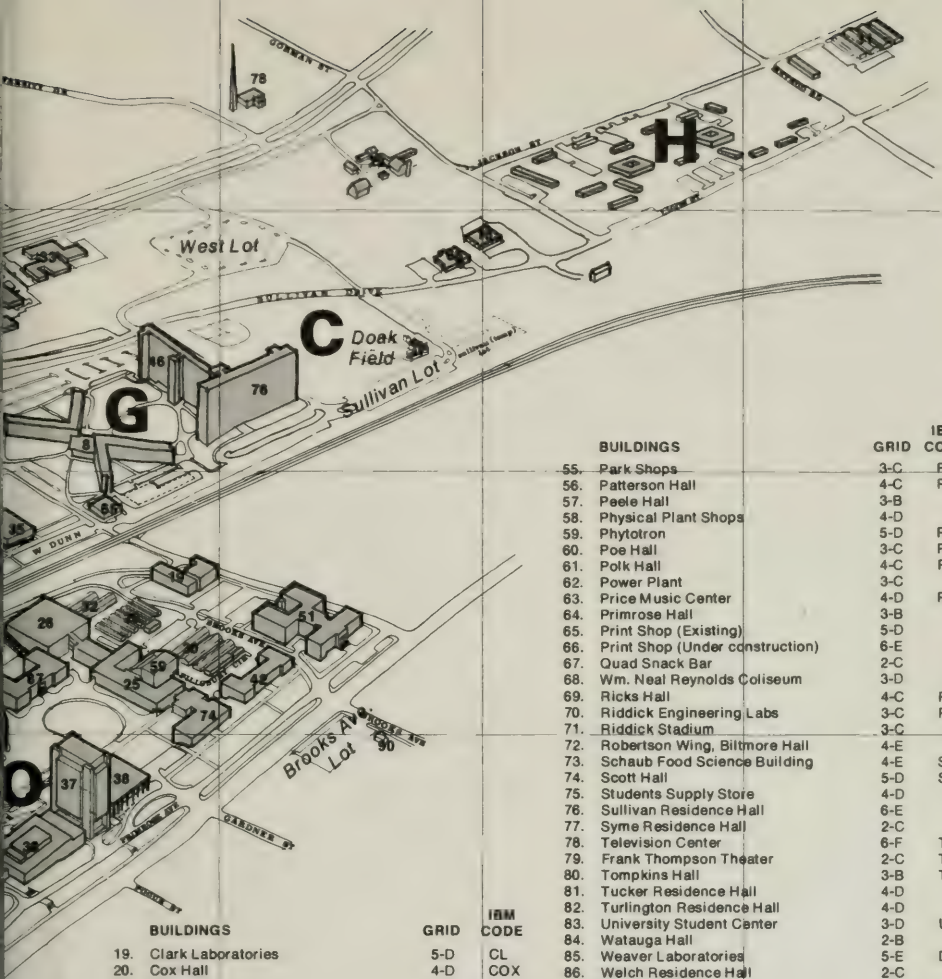
W. Douglas Cooper
J. M. Anthony Danby
Walter J. Dobrogosz
Harry E. Duncan
William T. Easter
James E. Huneycutt, Jr.
Michael A. Littlejohn
Clayton Stalnaker
Oscar B. Wooldridge

Administrative Council

Chancellor, *Chairman*	John T. Caldwell
Vice Chancellor and Provost	Nash N. Winstead
Acting Vice Provost and Dean, Graduate School	R. James Peeler, Jr.
Vice Provost and Dean, Research	Earl G. Droessler
Vice Chancellor for Extension and Public Service	W. L. Turner
Vice Chancellor for Student Affairs	Banks C. Talley, Jr.
Dean, International Programs	J. A. Rigney
Vice Chancellor for Finance and Business	J. D. Wright
Vice Chancellor for Foundations and Development	Rudolph Pate
Chairman, Faculty Senate	James B. Wilson
Dean, Agriculture and Life Sciences	J. E. Legates
Dean, Design	Claude E. McKinney
Dean, Education	Carl J. Dolce
Dean, Engineering	R. E. Fadum
Dean, Forest Resources	Eric L. Ellwood
Dean, Liberal Arts	Robert O. Tilman
Dean, Physical and Mathematical Sciences	A. C. Menius, Jr.
Dean, Textiles	David W. Chaney
Director, Athletics	Willis R. Casey

NORTH CAROLINA STATE UNIVERSITY
1974





	BUILDINGS	GRID	IBM CODE
19.	Clark Laboratories	5-D	CL
20.	Cox Hall	4-D	COX
21	Dabney Hall	4-D	DAB
22.	Daniels Hall	4-C	DAN
23.	Farm Unit 5	6-F	
24.	Field House	2-C	FH
D.	Fraternity Court	4-F	
25.	Gardner Hall	5-D	GA
26.	Gardner Hall Addition	5-D	
27.	Gold Residence Hall	2-C	
28.	Greenhouse—Agronomy	5-D	AGH
29.	Greenhouse—Biological Sciences	5-D	BSG
30.	Greenhouse—Horticulture	5-D	HGH
31.	Greenhouse—840 Method Rd.	8-F	
32.	Greenhouse—Plant Pathology	5-D	PPG
33.	Grinnells Animal Health Lab	5-E	GHL
34.	Harrelson Hall	5-D	HA
35.	Harris Cafeteria	5-D	
36.	D. H. Hill Library-original wing	5-C	DHL
37.	D. H. Hill Library-book stack tower	5-C	
38.	D. H. Hill Library-Erdahl-Cloyd wing	5-C	
39.	Hodges Wood Products Lab	4-E	HWP
40.	Holladay Hall	2-B	
41.	Information Center	2-B	
42.	Kilgore Hall	6-D	KI
43.	King Religious Center	2-B	KRC
44.	Laundry	3-C	
45.	Leazar Hall	3-B	LEZ
46.	Lee Residence Hall	5-E	
47.	Mann Hall	4-C	MN
H.	McKimmon Village (17 apt. bldgs. A-Q)	7-F	
48.	Memorial Tower	3-A	
49.	Metcalf Residence Hall	4-D	
50.	Morris Building	3-C	
51.	Nelson Textile Building	6-D	N
52.	1911 Building	4-C	
53.	Owen Residence Hall	4-D	
54.	Page Hall	3-C	PA

	BUILDINGS	GRID	IBM CODE
55.	Park Shops	3-C	PS
56.	Patterson Hall	4-C	PT
57.	Peele Hall	3-B	
58.	Physical Plant Shops	4-D	
59.	Phytotron	5-D	PHY
60.	Poe Hall	3-C	POE
61.	Polk Hall	4-C	PK
62.	Power Plant	3-C	
63.	Price Music Center	4-D	PMC
64.	Primrose Hall	3-B	
65.	Print Shop (Existing)	5-D	
66.	Print Shop (Under construction)	6-E	
67.	Quad Snack Bar	2-C	
68.	Wm. Neal Reynolds Coliseum	3-D	
69.	Ricks Hall	4-C	RI
70.	Riddick Engineering Labs	3-C	RD
71.	Riddick Stadium	3-C	
72.	Robertson Wing, Biltmore Hall	4-E	
73.	Schaub Food Science Building	4-E	SFS
74.	Scott Hall	5-D	SC
75.	Students Supply Store	4-D	
76.	Sullivan Residence Hall	6-E	
77.	Syme Residence Hall	2-C	
78.	Television Center	6-F	TVS
79.	Frank Thompson Theater	2-C	TT
80.	Tompkins Hall	3-B	T
81.	Tucker Residence Hall	4-D	
82.	Turlington Residence Hall	4-D	
83.	University Student Center	3-D	USC
84.	Watauga Hall	2-B	
85.	Weaver Laboratories	5-E	DSW
86.	Welch Residence Hall	2-C	
87.	Williams Hall	5-D	WMS
88.	Winston Hall	4-B	WN
89.	Withers Hall	4-C	WI
90.	Turner House	6-C	

	COURTS AND FIELDS	GRID
A.	Becton-Berry Quad	2-C
B.	Court of North Carolina	3-B
C.	Doak Field	6-E
D.	Fraternity Court	4-F
E.	Gardner Arboretum	4-C
F.	Holladay Hall Court	3-B
G.	Lee-Bragaw Court	5-E
H.	McKimmon Village	7-F
J.	Miller Fields	4-E
K.	Syme-Brooks Court	2-C
L.	Track	2-D
M.	Tucker-Owen Court	4-D
N.	Turlington-Alexander Court	4-D
O.	University Plaza	5-C
P.	University Student Center Plaza	3-D

	PARKING LOTS	
	Brooks Avenue Lot	6-C
	Carmichael Lot	3-D
	Coliseum Bays	3-D
	East Coliseum Lot	2-C
	Harris Lot	4-E
	Parking Deck	2-C
	Riddick Lot	3-C
	West Lot	6-E
	Sullivan Lot	6-E
	Sullivan Temporary Lot	7-E